

IUPAC
INTERNATIONAL UNION OF PURE AND APPLIED CHEMISTRY



COMPTES RENDUS

28th CONFERENCE

— PART A

MADRID

2—11 September 1975

©

International Union of Pure and Applied Chemistry
1976

IUPAC
SECRETARIAT

*

Bank Court Chambers
2-3 Pound Way
Cowley Centre
Oxford
OX4 3YF
UK

*

Telephone
Oxford
770125 & 772834

*

Telegrams
IUPAC OXFORD

*

Executive Secretary
M. WILLIAMS
B.Sc., Ph.D., F.R.I.C.

*

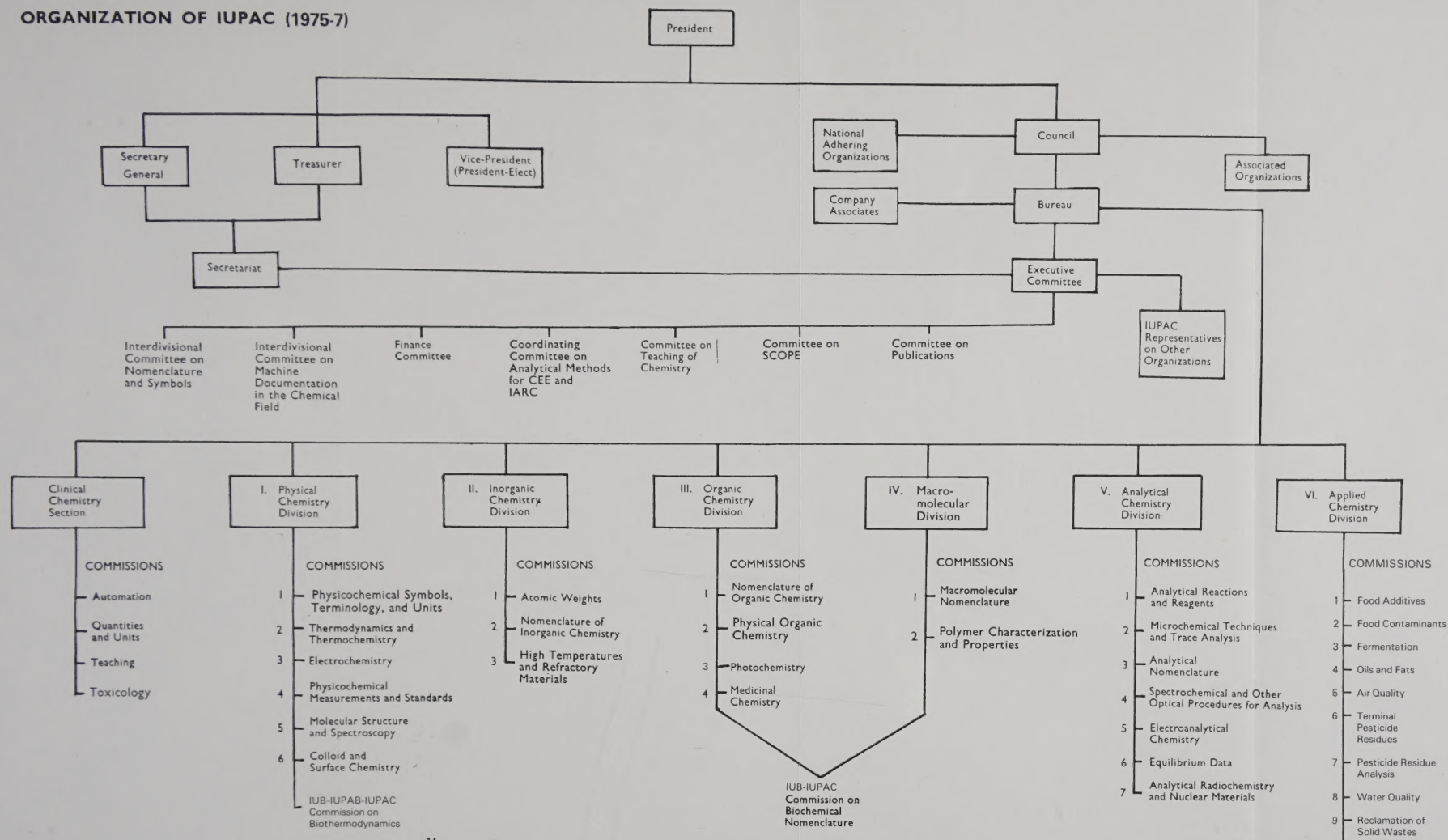
Assistant Secretary
(Administration)
ANN TROUGHTON

*

Assistant Secretary
(Publications)
P. D. GUJRAL
B.Sc., M.Sc.

ISBN: 0 08 021155 0

ORGANIZATION OF IUPAC (1975-7)



COMPTES RENDUS 28th CONFERENCE

PART A

MAINTENANCE

1-11 December 1978

IUPAC
INTERNATIONAL UNION OF PURE AND APPLIED CHEMISTRY



COMPTES RENDUS 28th CONFERENCE

— PART A

MADRID
2—11 September 1975

A. 1975—1977 MEMBERSHIP LISTS OF IUPAC BODIES

Dates indicate when a person was first elected to his present category of Membership of a Commission. For all other IUPAC bodies they indicate when he was first elected to Membership. Dates do not necessarily reflect the term of an Officer of an IUPAC body.

*

Some newly nominated Members of IUPAC bodies are included in the Membership Lists subject to the approval of the appropriate National Adhering Organizations.

TABLE OF CONTENTS

	Page
Bureau.....	1
Executive Committee	1
National Adhering Organizations	4
Associated Organizations	7
Company Associates	10
CHEMRAWN Planning Committee.....	18
Committee on Publications	19
Pure and Applied Chemistry	19
Committee on Teaching of Chemistry	20
Coordinating Committee for Analytical Methods for CEE and IARC	24
Finance Committee	25
Interdivisional Committee on Machine Documentation in the	
Chemical Field	26
Interdivisional Committee on Nomenclature and Symbols	27
Committee on SCOPE	29
IUB-IUPAC Commission on Biochemical Nomenclature	30
IUB-IUPAB-IUPAC Commission on Biothermodynamics.....	31
IUPAC Representatives on Other Organizations	32
Clinical Chemistry Section Committee	34
Commission on Automation	37
Commission on Quantities and Units	38
Commission on Teaching	39
Commission on Toxicology	40
Subcommittee on Environmental and Occupational	
Technology of Nickel	41
Physical Chemistry Division Committee.....	42
Commission on Physicochemical Symbols, Terminology, and	
Units	43
Commission on Thermodynamics and Thermochemistry	45
Subcommittee on Plasma Chemistry	47
Subcommittee on Thermodynamic Tables	48
Commission on Electrochemistry	49
Commission on Physicochemical Measurements and Standards	51
Subcommittee on Calibration and Test Materials	53
Commission on Molecular Structure and Spectroscopy	54
Subcommittee on Infrared and Raman Spectroscopy	56
Subcommittee on Storage and Retrieval of Spectroscopic	
Data.....	57
Subcommittee on Mass Spectroscopy.....	58
Commission on Colloid and Surface Chemistry	59
Inorganic Chemistry Division Committee	61
Commission on Atomic Weights	62
Commission on Nomenclature of Inorganic Chemistry	64
Commission on High Temperatures and Refractory Materials	66
Organic Chemistry Division Committee	69
Commission on Nomenclature of Organic Chemistry	71
Commission on Physical Organic Chemistry	73
Commission on Photochemistry	74
Commission on Medicinal Chemistry	75
Coordinating Committee on Education	77
Coordinating Committee on Long Range Planning	78

Macromolecular Division Committee	79
Commission on Macromolecular Nomenclature	83
Commission on Polymer Characterization and Properties	84
Analytical Chemistry Division Committee	85
Commission on Analytical Reactions and Reagents	86
Commission on Microchemical Techniques and Trace Analysis	88
Commission on Analytical Nomenclature	90
Commission on Spectrochemical and Other Optical Procedures for Analysis	92
Commission on Electroanalytical Chemistry	94
Commission on Equilibrium Data	96
Subcommittee on Solubility Data	98
Subcommittee on Stability Constant Data	99
Commission on Analytical Radiochemistry and Nuclear Materials	100
Applied Chemistry Division Committee	102
Commission on Food Additives	104
Commission on Food Contaminants	106
Coordinating Committee on Food Chemistry	108
Commission on Fermentation	109
Commission on Oils and Fats	111
Working Groups of Commission on Oils and Fats	115
Commission on Air Quality	118
Commission on Terminal Pesticide Residues	119
Commission on Pesticide Residue Analysis	121
Coordinating Committee on Pesticide Chemistry	123
Commission on Water Quality	124
Commission on Reclamation of Solid Wastes	125

Standing Orders of Executive Committee regarding

Committee on Publications	126
Committee on SCOPE	127
Committee on Teaching of Chemistry	128
Coordinating Committee for Analytical Methods for CEE and IARC	129
Finance Committee	130
Interdivisional Committee on Machine Documentation in the Chemical Field	131
Interdivisional Committee on Nomenclature and Symbols	132

Index to Members of IUPAC Bodies	135
---	------------

BUREAU

EXECUTIVE COMMITTEE

Dr. R. W. CAIRNS	(USA)
Prof. Sir HAROLD THOMPSON	(UK)
Prof. G. SMETS	(Belgium)
Prof. G. OURISSON	(France)
Prof. O. HORN	(Federal Republic of Germany)
Prof. Sir DEREK BARTON	(UK)
Prof. N. M. EMANUEL	(USSR)
Prof. H. SUOMALAINEN	(Finland)

President

- 1971-1977 CAIRNS, R. W., Dr.
American Chemical Society, 1155 Sixteenth Street NW,
Washington, DC 20036 (USA)
(TEL: 202-872-4455)

Past-President

- 1963-1977 THOMPSON, Prof. Sir HAROLD
St. John's College, Oxford OX1 3JP (UK)
(TEL: 0865-47671)

Vice-President

- 1969-1977 SMETS, G., Prof.
Laboratorium voor Macromoleculaire en Organische Scheikunde,
Universiteit te Leuven, Celestijnenlaan 200 F, B-3030 Heverlee
(Belgium)
(TEL: 016-35821)

Secretary General

- 1975-1979 OURISSON, G., Prof.
Institut de Chimie, Université Louis Pasteur, BP 296/R 8, 1 Rue
Blaise Pascal, F-67008 Strasbourg (France)
(TEL: 88-614802)

Treasurer

- 1971-1979 HORN, O., Prof.
Hoechst AG, Postfach 800320, D-6230 Frankfurt/Main 80
(Federal Republic of Germany)
(TEL: 0611-3057810. TELEX: 041234)

Elected Members

- 1975-1979 ABOU-EL-AZM, A., Prof.
Academy of Scientific Research and Technology, 101 Kasr El Eini
Street, Cairo (Arab Republic of Egypt)
- 1973-1977 BARTON, Prof. Sir DEREK
Department of Chemistry, Imperial College of Science and
Technology, South Kensington, London SW7 2AY (UK)
- 1973-1977 COLE, A. R. H., Prof.
School of Chemistry, University of Western Australia, Nedlands,
Western Australia (Australia 6009)

- 1975-1979 CRIVELLI, M. A., Dr.
Asociación Química Argentina, Sánchez de Bustamante 1749,
Buenos Aires (Argentina)
- 1971-1979 EMANUEL, N. M., Prof.
Institute of Chemical Physics, Academy of Sciences of USSR,
Vorobyevskoye Chaussée 2-b, 117334 Moscow (USSR)
- 1969-1977 GLEMSER, O., Prof.
Anorganisch-Chemisches Institut der Universität Göttingen,
Tammanstrasse 4, D-3400 Göttingen-Weende (Federal Republic
of Germany)
- 1969-1977 HEROUT, V., Prof.
Institute of Organic Chemistry and Biochemistry, Československá
Akademie Věd, Flemingovo Náměstí 2, CS-166 10 Praha 6-Dejvice
(Czechoslovakia)
- 1971-1979 ISLER, O., Dr.
F Hoffmann-La Roche & Co. AG, Grenzacherstrasse 124,
CH-4002 Basel (Switzerland)
- 1975-1979 NAGAKURA, S., Prof.
Institute for Solid State Physics, University of Tokyo, Roppongi,
Minatu-ku, Tokyo 106 (Japan)
- 1975-1979 PEREZ-MASIÁ, A., Prof.
Instituto de Química Física "Rocasolano", Consejo Superior de
Investigaciones Científicas, Serrano 119, Madrid-6 (Spain)
- 1969-1977 RANGASWAMI, S., Prof.
Department of Chemistry, University of Delhi, Delhi-110007
(India)
- 1969-1977 SUOMALAINEN, H., Prof.
Finnish State Alcohol Monopoly (Alko), POB 350, SF-00101
Helsinki 10 (Finland)

Division and Section Presidents

Clinical Chemistry Section

- 1975-1977 LOUS, P., Prof.
Department of Clinical Chemistry, Bispebjerg Hospital,
Bispebjerg Bakke 23, DK-2400 Kobenhavn NV (Denmark)

Physical Chemistry Division

- 1973-1977 JONES, R. N., Dr.
Division of Chemistry, National Research Council of Canada,
Ottawa, Ontario K1A 0R6 (Canada)

Inorganic Chemistry Division

- 1975-1977 MALATESTA, L., Prof.
Istituto di Chimica Generale dell'Università di Milano, Via G
Venezian 21, I-20133 Milano (Italy)

Organic Chemistry Division

- 1975-1977 ZOLLINGER, H., Prof.
Technisch-Chemisches Laboratorium der Eidgenössischen
Technischen Hochschule Zürich, Universitätstrasse 6, CH-8006
Zürich (Switzerland)

Macromolecular Division

- 1975-1977 OVERBERGER, C. G., Prof.
4080 Administration Building, University of Michigan, Ann
Arbor, Michigan 48109 (USA)

Analytical Chemistry Division

- 1973-1977 TANAKA, N., Prof.
Department of Chemistry, Faculty of Science, Tohoku University,
Aza Aoba, Aramaki, Sendai 980 (Japan)

Applied Chemistry Division

- 1973-1977 EGAN, H., Dr.
Laboratory of the Government Chemist, Department of Industry,
Cornwall House, Stamford Street, London SE1 9NQ (UK)

NATIONAL ADHERING ORGANIZATIONS

- Arab Republic of Egypt* Academy of Scientific Research and Technology
101 Kasr El Eini Street, Cairo
- Argentina* Asociación Química Argentina
Sánchez de Bustamente 1749, Buenos Aires
(TEL: 80-4096/83-4886)
- Australia* Australian Academy of Science
Gordon Street, Canberra City, ACT 2601
(TEL: 062-486011)
- Austria* Verein Österreichischer Chemiker
Eschenbachgasse 9, A-1010 Wien I
(TEL: 0222-574249)
- Belgium* Comité National Belge de Chimie
Palais des Académies, 1 Rue Ducale, B-1000 Bruxelles
- Brazil* Associação Brasileira de Química
Av. Rio Branco 156 S/907, Caixa Postal 550, Rio de Janeiro
(TEL: 242-9001)
- Bulgaria* Bulgarian Academy of Sciences
Ul. 1 "7 noemvri", Sofia 13
(TEL: 729820. TELEX: 22424)
- Canada* National Research Council of Canada
Ottawa, Ontario K1A 0R6
- Colombia* Ministerio de Minas y Petróleos
Sub-Dirección de Investigaciones Químicas del Instituto
Nacional de Investigaciones Geológico-Mineras
Carrera 30, Numero 51-59, Apartado Aéreo 4865, Bogotá, DE
(TEL: 443330)
- Cuba* Academia de Ciencias de la República de Cuba
Capitolio Nacional, La Habana
- Czechoslovakia* Czechoslovak National Committee of Chemistry
Hradčanské Náměstí 12, Praha 1-Hradčany
(TEL: 539074)
- Denmark* Danske Kemiske Foreningers Faellesråd for Internationalt
Samarbejde
Institut for Organisk Kemi, Danmarks Tekniske Højskole
Bygning 201, DK-2800 Lyngby
(TEL: 01-882566)
- Federal Republic of Germany* Deutscher Zentrallausschuss für Chemie
Carl Bosch-Haus, Varrentrappstrasse 40-42, Postfach 900440
D-6000 Frankfurt/Main 90
(TEL: 0611-79171)
- Finland* Suomen Kemian Seura
P. Hesperiankatu 3 B 10, SF-00260 Helsinki 26
(TEL: 90-408022)

<i>France</i>	Comité National Français de la Chimie 28 Rue Saint-Dominique, F-75007 Paris Cedex 07 (TEL: 551-1073)
<i>German Democratic Republic</i>	Akademie der Wissenschaften der DDR Otto-Nuschke-Strasse 22-23, 108 Berlin (TEL: 200481)
<i>Greece</i>	Association of Greek Chemists 27 Kaningos Street, Athens 147 (TEL: 0030-21-633597/621524)
<i>Hungary</i>	Hungarian Academy of Sciences Műnnich F.u. 7, POB 6, H-1361 Budapest (TEL: 383386)
<i>India</i>	Indian National Science Academy Bahadur Shah Zafar Marg, New Delhi-110001 (TEL: 27-2876)
<i>Ireland</i>	Royal Irish Academy 19 Dawson Street, Dublin 2 (TEL: 762570/764222)
<i>Israel</i>	Israel Academy of Sciences and Humanities 43 Jabotinsky Road, POB 4040, Jerusalem (TEL: 02-36211)
<i>Italy</i>	Consiglio Nazionale delle Ricerche Piazzale delle Scienze 7, I-00100 Roma (TEL: 06-4993)
<i>Japan</i>	Science Council of Japan 22-34 Roppongi 7-chome, Minato-ku, Tokyo 106 (TEL: 403-6291)
<i>Mexico</i>	Sociedad Química de México Apartado Postal 4-875, Ciprés 176, México 4, DF (TEL: 547-0646)
<i>Netherlands</i>	Koninklijke Nederlandse Chemische Vereniging Burnierstraat 1, POB 1766, NL-2018 s'-Gravenhage (TEL: 070-469406)
<i>New Zealand</i>	Royal Society of New Zealand 6 Halswell Street, POB 12249, Wellington (TEL: 45-516)
<i>Norway</i>	Norsk Kjemisk Selskap POB 1107-Blindern, Oslo 3
<i>Poland</i>	Polska Akademia Nauk Palace of Culture and Science, Warszawa
<i>Portugal</i>	Sociedade Portuguesa de Química c/o Complexo Interdisciplinar, Instituto Superior Técnico Avenida Rovisco Pais, Lisboa-1
<i>Republic of China</i>	Chinese Chemical Society POB 609, Taipei, Taiwan

- Republic of Korea* Korean Chemical Society
35, 5-Ka Anam-Dong, Sungbuk-ku, Seoul
(TEL: 94-5457)
- Republic of South Africa* Council for Scientific and Industrial Research
POB 395, Pretoria 0001
(TEL: 74-6011. TELEX: 3-630)
- Republic of Vietnam* Vietnamese Chemical Society
c/o Atomic Energy Office, POB Q-16, Saigon
- Romania* Academia Republicii Socialiste România
Section of Chemistry, Calea Victoriei 125, Bucureşti
- Spain* Consejo Superior de Investigaciones Científicas
Serrano 117, Madrid-6
(TEL: 2619800. TELEX: 42182)
- Sweden* Svenska Nationalkommittén för Kemi
Upplandsgatan 6 A, 1 tr, S-111 23 Stockholm
(TEL: 08-115260/115280)
- Switzerland* Schweizerisches Komitee für Chemie
c/o Organisch-Chemisches Institut der Universität Zürich
Rämistrasse 76, CH-8001 Zürich
(TEL: 01-326241)
- Turkey* Türkiye Kimya Derneği
Harbiye, Halaskargazi Caddesi, No. 53 D 8 Uzay Apartmanı
Posta Kutusu 829, Istanbul
(TEL: 407331)
- Union of Soviet Socialist Republics* Academy of Sciences of USSR
Leninskii Prospect 14, Moscow V-71
(TEL: 232-2910. TELEX: 7564 ANS SU)
- United Kingdom* Royal Society
6 Carlton House Terrace, London SW1Y 5AG
(TEL: 01-839-5561. TELEX: 917876)
- United States of America* National Research Council, National Academy of Sciences
2101 Constitution Avenue, Washington, DC 20418
(TEL: 202-389-6257)
- Venezuela* Instituto Venezolano de Investigaciones Científicas
Centro de Química, Apartado 1827, Caracas 101
(TEL: 691941. TELEX: 21338)
- Yugoslavia* Unija Hemijskih Društava Jugoslavije
Karnegijeve 4/III, Pošt. fah 494, YU-11001 Beograd
(TEL: 28-583)

ASSOCIATED ORGANIZATIONS

Association of Editors of European Chemistry Journals (EdEuChem)

Secretary/Treasurer

CROSS, L. C., Dr.

Chemical Society, Burlington House, Piccadilly, London W1V 0BN (UK)

(TEL: 01-734-9864. TELEX: 268001)

Association of Official Analytical Chemists (AOAC)

Executive Director

HORWITZ, W., Dr.

Association of Official Analytical Chemists, POB 540, Benjamin Franklin Station, Washington, DC 20044 (USA)

(TEL: 202-245-1301)

Comité International des Dérivés Tensio-Actifs (CID)

General Secretary

BIDAULT, J., Mr.

CID Secrétariat, 64 Avenue Marceau, F-75008 Paris (France)

(TEL: 720-5603)

European Federation of Chemical Engineering

Offices of General Secretariat

Frankfurt Office

DECHEMA

Theodor-Heuss-Allee 25, Postfach 970146, D-6000 Frankfurt/Main 97 (Federal Republic of Germany)

(TEL: 0611-770481)

London Office

Institution of Chemical Engineers, 16 Belgrave Square, London SW1X 8PT (UK)

(TEL: 01-235-3647)

Paris Office

Société de Chimie Industrielle, 80 Route de Saint-Cloud, F-92 Rueil-Malmaison (France)

(TEL: 967-0608)

European Photochemistry Association

Chairman

SCHAFFNER, K., Prof.

Département de Chimie Organique, Université de Genève, 30 Quai Ernest Ansermet, CH-1211 Genève 4 (Switzerland)

(TEL: 241268)

Federation of European Chemical Societies

Secretariats

PARKER, R. E., Dr.

Royal Institute of Chemistry, 30 Russell Square, London WC1B 5DT (UK)

(TEL: 01-580-3482)

PREISICH, M., Mr.
Magyar Kémikusok Egyesülete, Anker Köz 1, Budapest VI
(Hungary)
(TEL: 427-343)

**Groupeement pour l'Avancement des Méthodes
Spectroscopiques et Physico-chimiques d'Analyse
(GAMS)**

Director

EMSCHWILLER, G., Prof.
GAMS, 8-10 Rue du Delta, F-75009 Paris (France)
(TEL: 285-3913/3952)

**International Association for Advancement of High
Pressure Science and Technology (AIRAPT)**

Secretariat

AIRAPT, c/o Maison des Industries Chimiques, 49 Square
Marie-Louise, B-1040 Bruxelles (Belgium)
(TEL: 02-317051/314063)

**International Association of Geochemistry and
Cosmochemistry**

President

AHRENS, L. H., Prof.
Department of Geochemistry, University of Cape Town, Private
Bag, Rondebosch, Cape (Republic of South Africa)

**International Association on Water Pollution
Research (IAWPR)**

Secretary-Treasurer

FAIRALL, R., Mr.
Chichester House, 278 High Holborn, London WC1V 7H6 (UK)
(TEL: 01-405-4552)

**International Committee for Science of
Photography (ICSP)**

Secretary

PIETSCH, H., Prof.
Chemische Gesellschaft der DDR, Friedrichshagenerstrasse 9,
117 Berlin (German Democratic Republic)

International Committee on Rheology

Secretary

VALLET, G., Dr.
Centre Technique du Cuir, 181 Avenue Jean-Jaures, F-69007
Lyon (France)

**International Confederation for Thermal
Analysis (ICTA)**

President

KAMBE, H., Prof.
Institute of Space and Aeronautical Science, University of Tokyo,
6-1 Komaba 4, Meguro-ku, Tokyo 153 (Japan)
(TEL: 03-467-1111)

International Conferences on Coordination Chemistry

Permanent Secretary

KIRSCHNER, S., Prof.

Department of Chemistry, Wayne State University, Detroit 2,
Michigan 48202 (USA)

International Congress on Catalysis

Secretary

DOWDEN, D. A., Prof.

Agricultural Division, Imperial Chemical Industries Ltd., POB 6,
Billingham, Teesside TS23 1LD (UK)

(TEL: 0642-553601)

International Federation of Clinical Chemistry

Secretary

BROUGHTON, P. M. G., Mr.

University Department of Chemical Pathology, General Infirmary,
Leeds LS1 3EX (UK)

(TEL: 0532-32799)

International Organization of Crystal Growth (IOCG)

Secretary

SCHIEBER, M., Prof.

School of Applied Science and Technology, Hebrew University of
Jerusalem, Jerusalem (Israel)

International Society of Electrochemistry (formerly CITCE)

Secretary General

LANDOLT, D., Prof.

Département des Matériaux, École Polytechnique Fédérale de
Lausanne, 34 Chemin de Bellerive, CH-1007 Lausanne

(Switzerland)

(TEL: 021-264649. TELEX: 24-478)

International Society of Heterocyclic Chemistry

President

CASTLE, R. N., Prof.

University Station—POB 524, Provo, Utah 84601 (USA)

International Society of Magnetic Resonance

Chairman

FIAT, D., Dr.

Weizmann Institute of Science, Rehovot (Israel)

(TEL: 03-951721)

COMPANY ASSOCIATES (1975)

<i>Arab Republic of Egypt</i>	Kafr El Zayat Pesticides & Chemicals Co. Kafr El Zayat Misr Chemical Industries Alexandria
<i>Australia</i>	Dulux Australia Ltd. POB 60, Clayton, Victoria 3168
<i>Belgium</i>	NV Gevaert-Agfa Septestraat 27, B-2510 Mortsel Poudreries Réunies de Belgique SA 12 Avenue de Broqueville, B-1150 Bruxelles SA Solvay et Cie 33 Rue du Prince Albert, B-1050 Bruxelles SA Union Chimique de Belgique 4 Chaussée de Charleroi, Bruxelles 6
<i>Canada</i>	Polymer Corpn. Ltd. Sarnia, Ontario Warner-Lambert Canada Ltd. 2200 Eglinton Avenue East, Scarborough, Ontario M1L 2N3
<i>Czecho- slovakia</i>	CHEMOPETROL Generální Ředitelství, Trojská 13 CS-180 00 Praha 8-Kobylisy Průmysl Papíru a Celulózy Štěpánská 30, CS-113 73 Praha UNICHEM Oborové Ředitelství, Náměstí Budovatelů 1458 CS-532 06 Pardubice Výzkumný Ústav Potravinářského Průmyslu Na Bělidle 21, CS-150 00 Praha 5-Smíchov Výzkumný Ústav Pre Petrochémiu Naváky
<i>Federal Republic of Germany</i>	BASF AG D-6700 Ludwigshafen/Rhein Bayer AG D-5090 Leverkusen-Bayerwerk C H Boehringer Sohn 173 Binger Strasse, D-6507 Ingelheim/Rhein Chemische Fabrik Kalk GmbH Postfach 910210, D-5000 Köln 91 Chemische Werke Hüls AG Postfach 1180, D-4370 Marl Kreis Recklinghausen

Degussa AG
 Weissfrauenstrasse 9, Postfach 2644, D-6000 Frankfurt/Main 1
 Dynamit Nobel AG
 Postfach 1209, D-5210 Troisdorf
 Hoechst AG
 Postfach 800320, D-6230 Frankfurt/Main 80
 Fa. Carl Freudenberg
 Postfach 189, D-6940 Weinheim/Bergstr.
 Th. Goldschmidt AG
 Postfach 17, D-4300 Essen 1
 Henkel & Cie GmbH
 Postfach 1100, D-4000 Düsseldorf 1
 Knoll AG
 Knollstrasse 50, Postfach 210805
 D-6700 Ludwigshafen/Rhein
 E Merck AG
 Frankfurter Strasse 250, Postfach 4119, D-6100 Darmstadt 2
 Metallgesellschaft AG
 Reuterweg 14, D-6000 Frankfurt/Main
 Schering AG
 Müllerstrasse 170-172, Postfach 650311, D-1000 Berlin 65
 Süd-Chemie AG
 Lenbachplatz 6, Postfach 210, D-8000 München 3
 Union Rheinische Braunkohlen Kraftstoff AG
 Postfach 8, D-5047 Wesseling, Bez. Köln
 Wacker-Chemie GmbH
 Postfach 1, D-8000 München 22

Finland

Kemian Keskusliitto
 Fabianinkatu 7 B, POB 13028, Helsinki 13

France

ATO Chimie SA
 Tour Aquitaine Cedex No. 4, F-92080 Paris-La Défense
 Kodak-Pathé SA
 30 Rue des Vignerons, F-94300 Vincennes
 L'OREAL SA
 11 bis, Rue Boissy d'Anglas, F-75381 Paris Cedex 08
 Pechiney Ugine Kuhlmann SA
 23 Rue Balzac, BP 787.08, F-75360 Paris Cedex 08
 Rhône-Poulenc SA
 22 Avenue Montaigne, F-75008 Paris
 Roussel Uclaf SA
 Centre de Recherches Roussel Uclaf, 102 Route de Noisy
 F-93230 Romainville

- Greece* General Chemical State Laboratories
16 Anastasiou Tsocha, Athens 602
- Italy* ANIC SpA
Casella Postale 3587, I-20100 Milano
Carlo Erba SpA
Via Carlo Imbonati 24, I-20159 Milano
Gruppo Lepetit SpA
Via Lepetit 8, I-20124 Milano
Istituto Chemioterapico Italiano SpA
I-20075 San Grato di Lodni, Milano
Montedison SpA
Largo Donegani 1/2, I-20121 Milano
- Japan* Ajinomoto Co. Inc.
Suzuki-cho, Kawasaki-ku, Kawasaki 210
Asahi Chemical Industry Co. Ltd.
12, 1-chome, Yurakucho, Chiyoda-ku, Tokyo 100
Asahi Glass Co. Ltd.
14,2-chome, Marunouchi, Chiyoda-ku, Tokyo 100
Banyu Pharmaceutical Co. Ltd.
7,2-chome, Nihonbashi Honcho, Chuo-ku, Tokyo 103
Daiichi Seiyaku Co. Ltd.
2810 Minamifunaboricho, Edogawa-ku, Tokyo 132
Dainippon Pharmaceutical Co. Ltd.
Ebie-kami 2, Fukushimaku, Osaka 553
Fujisawa Pharmaceutical Co. Ltd.
No. 1, Kashima-cho, Higashiyodogawa-ku, Osaka 532
Kao Soap Co. Ltd.
2-1 Nihonbashi-Bakuro-cho, Chuo-ku, Tokyo 103
Kureha Chemical Industry Co. Ltd.
1-8 Horidome-cho, Nihonbashi, Chuo-ku, Tokyo 103
Kyowa Hakko's Tokyo Research Laboratory
6-6,3-chome Asahimachi, Mashidashi, Tokyo 194
Maruzen Oil Co. Ltd.
5-3, 1-chome, Ohtemachi, Chiyoda-ku, Tokyo 100
Meiji Seika Kaisha Ltd.
Morooka-cho, Kohoku-ku, Yokohama 222
Mitsubishi Chemical Industries Ltd.
290 Kamoicho Hisamoto, Kawasaki 213
Mitsui Petrochemical Industries Ltd.
2-5,3-chome, Kasumigaseki, Chiyoda-ku, Tokyo 100
Mitsui Toatsu Chemicals Co.
No. 1190 Kasama-cho, Totsuka-ku, Yokohama 247

Naito Memorial Museum of Pharmaceutical Science
c/o Eisai Co., 4-Koishikawa, Bunkyo-ku, Tokyo 112

Nippon Kayaku Co. Ltd.
2,1-chome Marunouchi, Chiyoda-ku, Tokyo 100

Sagami Chuo Kagaku Kenkyujo
4-1,4-chome, Nishionuma, Sagamihara-shi, Kanagawa 229

Sankyo Co. Ltd.
2-58 Hiromachi 1-chome, Shinagawa-ku, Tokyo 140

Sanyo Chemical Industries
11-1, Nomoto-cho, Ichinohashi, Higashiyama-ku, Kyoto 605

Shin-etsu Chemical Industry Co. Ltd.
Otemachi 2-6-1, Chiyoda-ku, Tokyo 100

Shionogi & Co. Ltd.
Fukushima-ku, Osaka 553

Showa Denko KK
34 Shiba-Miyamoto-cho, Minato-ku, Tokyo 105

Sumitomo Chemical Co. Ltd.
15,5-chome, Kitahama, Higashi-ku, Osaka 541

Suntory Ltd.
475 Oaza-Hirose, Shimoto-cho, Mishima-gun, Osaka-fu 618

Takeda Chemical Industries Ltd.
4-54 Nishino-cho, Juso, Osaka 532

Tanabe Seiyaku Co. Ltd.
962 Kash macho, Higashi-Yodogawa-ku, Osaka 532

Teijin Ltd.
1-1,2-chome Uchisaiwai-cho, Chiyoda-ku, Tokyo 100

Tokuyama Soda Co. Ltd.
1-1 Mikage-cho, Tokyama, Yamaguchi 745

Tokyo Fuji Photo Film Co. Ltd.
Asakashi, Saitama 351

Toray Industries Inc.
2 Nihonbashi-Muromachi 2-chome, Chuo-ku, Tokyo 103

Toyo Seikan Kaisha Ltd.
1-1-70 Yako, Tsurumi-ku, Yokohama 230

*New
Zealand*

Ivan Watkins-Dow Ltd.
POB 144, New Plymouth

New Zealand Forest Products Ltd.
Private Bag, Auckland

*Republic of
South
Africa*

African Explosives and Chemical Industries Ltd.
c/o Council for Scientific and Industrial Research
POB 395, Pretoria 0001

Sweden

Kema Nord AB
Fack, S-100 61 Stockholm 11

Switzerland CIBA-GEIGY AG

CH-4002 Basel

Firmenich & Co. AG

CH-1211 Geneva 8

F Hoffmann-La Roche & Co. AG

Grenzacherstrasse 124, CH-4002 Basel

Lonza AG

Münchensteinerstrasse 38, CH-4002 Basel

Nestle Alimentana AG

CH-1800 Vevey

Sandoz AG

CH-4002 Basel

*United
Kingdom*

British Petroleum Co. Ltd.

Britannic House, Moor Lane, London EC2Y 9BU

CIBA-GEIGY (UK) Ltd.

30 Buckingham Gate, London SW1E 6LH

Courtaulds Ltd.

18 Hanover Street, London W1A 2BB

Distillers Co. Ltd.

Glenochil Technical Centre, Menstrie, Clackmannanshire

FK11 7ES

Esso Petroleum Co. Ltd.

Esso House, Victoria Street, London SW1E 5JW

Fisons Ltd.

Fison House, Princes Street, Ipswich IP1 1QH, Suffolk

Glaxo Group Ltd.

Clarges House, 6-12 Clarges Street, London W1Y 8DH

Imperial Chemical Industries Ltd.

Imperial Chemical House, Millbank, London SW1P 3JF

Laporte Industries Ltd.

Kingsway, POB 8, Luton LU4 8EW, Bedfordshire

May & Baker Ltd.

Dagenham, Essex RM10 7XS

Monsanto Ltd.

Monsanto House, 10-18 Victoria Street, London SW1H 0NQ

Pfizer Ltd.

Sandwich, Kent CT13 9NJ

Shell Research Ltd.

Shell Centre, London SE1 7PG

John & E Sturge Ltd.

1 Wheellys Road, Birmingham B15 2LE

Synthetic Chemicals Ltd.

Oldbury, Warley, West Midlands B69 4HF

Unilever Ltd.
Unilever House, Blackfriars, POB 68, London EC4P 4BQ
Wellcome Foundation Ltd.
Wellcome Building, 183 Euston Road, POB 129, London
NW1 2BP

United States of America Abbott Laboratories
North Chicago, Illinois 60064

Allied Chemical Corpn.
Morristown, New Jersey 07960

American Cyanamid Co.
Bound Brook, New Jersey 08805

Amoco Chemicals Corpn.
POB 400, Naperville, Illinois 60540

BASF Wyandotte Corpn.
Wyandotte, Michigan 48192

Bell Telephone Laboratories Inc.
600 Mountain Avenue, Murray Hill, New Jersey 07974

Cabot Corpn.
Concord Road, Billerica, Massachusetts 01821

CIBA-GEIGY Corpn.
Ardsley, New York 10502

Commercial Solvents Corpn.
1331 South First Street, Terre Haute, Indiana 47808

Corning Glass Works
Corning, New York 14830

Diamond Shamrock Corpn.
POB 348, Painesville, Ohio 44077

Dow Chemical Co.
Midland, Michigan 48640

Eastman Kodak Co.
1669 Lake Avenue, Rochester, New York 14650

Exxon Research and Engineering Co.
POB 101, Florham Park, New Jersey 07932

Firestone Tire & Rubber Co.
1200 Firestone Parkway, Akron, Ohio 44317

FMC Corpn.
POB 8, Princeton, New Jersey 08540

General Electric Co.
POB 8, Schenectady, New York 12301

General Tire and Rubber Co.
POB 951, Akron, Ohio 44309

Givaudan Corpn.
125 Delawanna Avenue, Clifton, New Jersey 07014

Goodyear Tire and Rubber Co.
 142 Goodyear Boulevard, Akron, Ohio 44316
 W R Grace and Co.
 Washington Research Center, Clarksville, Maryland 21029
 GTE Sylvania Inc.
 Towanda, Pennsylvania 18848
 Gulf Research and Development Co.
 POB 2038, Pittsburgh, Pennsylvania 15230
 Hercules Inc.
 Hercules Research Center, Wilmington, Delaware 19899
 Hoffmann-La Roche Inc.
 Nutley, New Jersey 07110
 ICI United States Inc.
 Wilmington, Delaware 19899
 Eli Lilly and Co.
 POB 618, Indianapolis, Indiana 46206
 Arthur D Little Inc.
 Acorn Park, Cambridge, Massachusetts 02140
 McNeil Laboratories Inc.
 Camp Hill Road, Fort Washington, Pennsylvania 19034
 Merck, Sharp and Dohme Research Laboratories
 Rahway, New Jersey 07065
 Mobil Research and Development Corp.
 POB 1025, Princeton, New Jersey 08540
 Monsanto Co.
 800 N Lindbergh Boulevard, St. Louis, Missouri 63166
 Nalco Chemical Co.
 2901 Butterfield Road, Oak Brook, Illinois 60521
 Owens-Illinois Inc.
 POB 1035, Toledo, Ohio 43601
 Chas. Pfizer and Co. Inc.
 Eastern Point Road, Groton, Connecticut 06340
 Philip Morris USA
 Research Center, POB 26583, Richmond, Virginia 23261
 Phillips Petroleum Co.
 Bartlesville, Oklahoma 74004
 Polaroid Corp.
 730 Main Street, Cambridge, Massachusetts 02139
 E I du Pont de Nemours and Co. Inc.
 Wilmington, Delaware 19898
 PPG Industries Inc.
 One Gateway Center, Pittsburgh, Pennsylvania 15222

A H Robins Co. Inc.
1211 Sherwood Avenue, Richmond, Virginia 23220

Rohm and Haas Co.
Norristown and McKean Roads, Spring House, Pennsylvania
19477

Schering Corp.
60 Orange Street, Bloomfield, New Jersey 07003

G D Searle and Co.
POB 5110, Chicago, Illinois 60680

Shell Development Co.
POB 24225, Oakland, California 94623

Smith, Kline and French Laboratories
1500 Spring Garden Street, Philadelphia, Pennsylvania 19101

Standard Oil Co. (Indiana)
POB 400, Naperville, Illinois 60540

Stauffer Chemical Corp.
Eastern Research Center, Dobbs Ferry, New York 10522

Sterling Winthrop Research Institute
Rensselaer, New York 12144

Syntex Corp.
Stanford Industrial Park, Palo Alto, California 94304

Tennessee Eastman Co.
POB 511, Kingsport, Tennessee 37662

Union Carbide Corp.
270 Park Avenue, New York, New York 10017

Universal Oil Products Co.
Ten UOP Plaza, Mt. Prospect & Algonquin Road, Des Plaines
Illinois 60016

Upjohn Co.
Kalamazoo, Michigan 49001

Warner-Lambert Research Institute
170 Tabor Road, Morris Plains, New Jersey 07950

Westvaco
Westvaco Building, 299 Park Avenue, New York, New York
10017

CHEMRAWN · PLANNING COMMITTEE*

(Established 1976)

Chairman

ROSSITER, B. W., Dr.
Chemistry Division, Research Laboratories, Eastman Kodak Co.,
1669 Lake Avenue, Rochester, New York 14650 (USA)
(TEL: 716-458-1000)

Members

ABOU-EL-AZM, A., Prof.
Academy of Scientific Research and Technology, 101 Kasr El
Eini Street, Cairo (Arab Republic of Egypt)

BARRETT, J. W., Dr.
Monsanto Ltd., Monsanto House, 10-18 Victoria Street, London
SW1 0NQ (UK)

BEHRENS, D., Prof.
DECHEMA, Theodor-Heuss-Allee 25, Postfach 970146, D-6000
Frankfurt/Main 97 (Federal Republic of Germany)

EGAN, H., Dr.
Laboratory of the Government Chemist, Department of Industry,
Cornwall House, Stamford Street, London SE1 9NQ (UK)

OVERBERGER, C. G., Prof.
4080 Administration Building, University of Michigan, Ann Arbor,
Michigan 48109 (USA)

ZOLLINGER, H., Prof.
Technisch-Chemisches Laboratorium der Eidgenössischen
Technischen Hochschule Zürich, Universitätstrasse 6, CH-8006
Zürich (Switzerland)

*CHEMRAWN = Chemical Research Applied to World Needs

COMMITTEE ON PUBLICATIONS (CP)*

(Established in its present form 1969)

Chairman

- 1973- OURISSON, G., Prof.
Institut de Chimie, Université Louis Pasteur, BP 296/R 8, 1 Rue
Blaise Pascal, F-67008 Strasbourg (France)
(TEL: 88-614802)

Members

- 1974- BLAHA, K., Dr.
Institute of Organic Chemistry and Biochemistry, Československá
Akademie Věd, Flemingovo Náměstí 2, CS-166 10 Praha 6-Dejvice
(Czechoslovakia)
- 1969- CROSS, L. C., Dr.
Chemical Society, Burlington House, Piccadilly, London
W1V 0BN (UK)
- 1969- GRÜNEWALD, H., Dr.
Gesellschaft Deutscher Chemiker, Boschstrasse 12, D-6940
Weinheim (Federal Republic of Germany)
- 1973- PEREZ-MASIÁ, A., Prof.
Instituto de Química Física "Rocasolano", Consejo Superior de
Investigaciones Científicas, Serrano 119, Madrid-6 (Spain)

Scientific Editor

- 1976- CULLIS, C. F., Prof.
Department of Chemistry, City University St. John Street,
London EC1V 4PB (UK)

PURE AND APPLIED CHEMISTRY (PAC)

Official Journal of IUPAC

Scientific Editor

- 1976- CULLIS, C. F., Prof.
Department of Chemistry, City University, St. John Street,
London EC1V 4PB (UK)
(TEL: 01-253-4399)

Assistant Scientific Editor

- 1976- KIRK, D. N., Dr.
Department of Chemistry, Westfield College, Kidderpore Avenue,
London NW3 7ST (UK)
(TEL: 01-435-7141)

*For Standing Orders, see page 126

COMMITTEE ON TEACHING OF CHEMISTRY (CTC)*

(Established 1963)

Chairman

- 1971- RAO, C. N. R., Prof.
Department of Chemistry, Indian Institute of Technology, Kanpur
208016, Uttar Pradesh (India)
(TEL: 43531. TELEX: 032-296)

Secretary

- 1966- CHISMAN, D. G., Mr.
British Council, 10 Spring Gardens, London SW1A 2BN (UK)
(TEL: 01-930-8466)

Members

- 1974- BEREZIN, I. V., Prof.
Department of Chemistry, Lomonosov State University of Moscow,
Leninskii Gory, 117234 Moscow (USSR)
- 1975- HAMMOND, G. S., Prof.
Merrill College, University of California, Santa Cruz, California
95064 (USA)
- 1974- HELLMANN, H., Prof.
Chemische Werke Hüls AG, Postfach 1180, D-4370 Marl Kreis
Recklinghausen (Federal Republic of Germany)
- 1974- ILLUMINATI, G., Prof.
Istituto Chimica, Università di Roma, I-00185 Roma (Italy)
- 1974- LAFFITTE, M., Prof.
Centre de Recherches de Microcalorimétrie et de Thermochimie
du Centre National de la Recherche Scientifique, 26 Rue du 141^e
RIA, F-13003 Marseille (France)
- 1973- VITOROVIČ, D., Prof.
Institute of Chemistry, Faculty of Sciences, University of Beograd,
16 Studentski Trg, POB 550, YU-11000 Beograd (Yugoslavia)

National Representatives

- Arab Republic of Egypt*
1973-1977 SADEK, H., Dr.
Vice-Rector's Office for Graduate Studies and Research,
University of Alexandria, Alexandria
- Argentina*
1971-1977 GUERRERO, A. H., Prof.
Biophysics Research Institute, Viamonte 1634, Buenos Aires
- Australia*
1969-1977 BROWN, R. D., Prof.
Department of Chemistry, Monash University, Clayton, Victoria
3168
- Austria*
1971-1977 MASCHKA, A., Prof.
Lehargasse 4, A-1060 Wein

*For Standing Orders, see page 128

- Belgium* DE BROUCKERE, L., Prof.
1970-1977 Université Libre de Bruxelles, 50 Avenue F D Roosevelt, B-1050 Bruxelles
- Brazil* GIESBRECHT, E., Prof.
1971-1977 Instituto de Química, Universidade de São Paulo, Caixa Postal 8105, São Paulo
- Bulgaria* BLIZNAKOV, G. N., Prof.
1972-1977 Department of Inorganic Chemistry, Faculty of Chemistry, University of Sofia, Sofia
- Canada* NEWBOLD, B. T., Prof.
1970-1977 Department of Chemistry, University of Moncton, Moncton, New Brunswick E1A 3E9
- Colombia* NIÑO, L. C., Dr.
1970-1977 Departamento de Química, Ciudad Universitaria, Bogotá
- Cuba* BERTRÁN, J. F., Dr.
1972-1977 Viceministerio para la Enseñanza Superior, Ministerie de Educación, Obispo y Mercaderes, La Habana
- Czechoslovakia* GAŽO, J., Prof.
1973-1977 Institute of Inorganic Chemistry, Chem. Techn. Fakulta, Slovenská Vysoká Škola Technická, Jánska 1, CS-800 00 Bratislava
- Denmark* RANCKE-MADSEN, E., Prof.
1970-1977 Kemisk Institut, Danmarks Laerhøjskole, Emdrupvej 115 B, DK-2400 København NV
- Federal Republic of Germany* HOFACKER, U., Dr.
1975-1977 Kaiserstrasse 56, D-8000, München 40
- Finland* ANTIKAINEN, P. J., Prof.
1970-1977 Department of Basic Instruction in Chemistry, Medical Faculty, University of Helsinki, SF-00170 Helsinki 17
- France* GUILLAUMONT, R., Prof.
1976-1977 Division de l'Enseignement de la Chimie de la Société Chimique de France, 250 Rue Saint-Jacques, F-75005 Paris
- German Democratic Republic* BREMER, H., Prof.
1975-1977 Technische Hochschule "Carl Schorlemmer", Geusaer Strasse, 42 Merseburg
- Greece* KARAGUNIS, G., Prof.
1971-1977 Association of Greek Chemists, 27 Kaningos Street, Athens 147
- Hungary* PAIS, I., Prof.
1969-1977 Department of Chemistry, University of Horticulture, Villányi Út 29-31, Budapest XI
- India* SUBBA RAO, N. V., Prof.
1970-1977 Department of Chemistry, University College of Science, Osmania University, Hyderabad-7, Andhra Pradesh

- Ireland* START, P. A., Mr.
1974-1977 Department of Chemistry, University College, Dublin
- Israel* SAMUEL, D., Prof.
1972-1977 Weizmann Institute of Science, Rehovot
- Italy* BARGELLINI, A., Prof.
1976-1977 Istituto di Chimica Organica dell'Università di Pisa, Pisa
- Japan* MUTO, G., Prof.
1970-1977 Institute of Industrial Science, University of Tokyo, 7-22-1 Roppongi, Minato-ku, Tokyo
- Mexico* SAHAGÚN, A. B., Prof.
1971-1977 Colegio de Ciencias y Humanidades, Universidad Nacional Autónoma de México, Ciudad Universitaria, México, DF
- Netherlands* DEN OS, D. P., Dr.
1973-1977 Koninklijke Nederlandse Chemische Vereniging, Burnierstraat 1, POB 1766, NL-2018 's-Gravenhage
- New Zealand* HITCHINGS, T., Mr.
1969-1977 Riccarton High School, Carlett's Road, Christchurch 4
- Norway* KALLAND, G., Dr.
1969-1977 Institute of Nutrition Research, University of Oslo, POB 1046, Blindern, Oslo 3
- Poland* JEŻOWSKA-TRZEBIATOWSKA, B., Prof.
1972-1977 Instytut Chemii, Uniwersytet Wrocławski, Ul. Joliot-Curie 14, Wrocław
- Portugal* CARDOSA PEREIRA, J. L., Prof.
1976-1977 Laboratório de Química Organica, Faculdade de Ciências, Lisboa-2
- Republic of China* PENG, YU-TSAI, Prof.
1970-1977 Department of Chemistry, National Taiwan Normal University, Ho-ping Road East, Taipei, Taiwan
- Republic of Korea* SANG UP CHOI, Dr.
1972-1977 Korean Chemical Society, 35, 5-Ka Anam-Dong, Sungbuk-ku, Seoul
- Republic of South Africa* ARNDT, R. R., Prof.
1973-1977 Department of Chemistry, Randse Afrikaanse Universiteit, POB 524, Johannesburg
- Republic of Vietnam* LE-VAN-THOI, Prof.
1970-1977 Vietnamese Chemical Society, c/o Atomic Energy Office, POB Q-16, Saigon
- Romania* SIMIONESCU, C. I., Prof.
1970-1977 Akademia Republicii Socialiste România, Strada Universitatii Nr.16, Iași
- Spain* MORCILLO RUBIO, J., Prof.
1972-1977 Facultad de Ciencias, Universidad de Madrid, Madrid
- Sweden* LEDEN, I., Prof.
1969-1977 Chemical Center, University of Lund, POB 740, S-220 07 Lund 7

- Switzerland*
1970-1977 DREIDING, A. S., Prof.
Organisch-Chemisches Institut der Universität Zürich,
Rämistrasse 76, CH-8001 Zürich
- Turkey*
1971-1977 BERKEM, A. R., Prof.
Istanbul Üniversitesi Kimya Fakültesi, Bayezit, Istanbul
- United Kingdom*
1969-1977 ROBINSON, M. D., Dr.
Chemical Society, Burlington House, Piccadilly, London
W1V 0BN
- United States of America*
1970-1977 COOK, W. B., Prof.
College of Natural Sciences, Colorado State University, Fort
Collins, Colorado 80521
- Union of Soviet Socialist Republics*
1976-1977 SOKOLOVSKAYA, E. M., Prof.
Department of Chemistry, Lomonosov State University of Moscow,
Leninskii Gory, 117234 Moscow
- Venezuela*
1971-1977 CORTÉS, L., Dr.
Escuela de Química, Universidad Central de Venezuela, Caracas

COORDINATING COMMITTEE FOR ANALYTICAL METHODS FOR CEE AND IARC (CCAM)*

(Established in its present form 1975)

Chairman

- 1969- TRUHAUT, R., Prof.
Laboratoire de Toxicologie et d'Hygiène Industrielle, Faculté des
Sciences Pharmaceutiques et Biologiques de Paris Luxembourg,
Université René Descartes, 4 Avenue de l'Observatoire, F-75006
Paris Cedex 06 (France)
(TEL: 326-2680)

Secretary

- 1972- PELLERIN, F., Prof.
Hôpital Général Emile Roux, F-95600 Eaubonne (France)
(TEL: 1-959-5520)

Members

- 1969- BELCHER, R., Prof.
Department of Chemistry, University of Birmingham, POB 363,
Birmingham B15 2TT (UK)
- 1969- EGAN, H., Dr.
Laboratory of the Government Chemist, Department of Industry,
Cornwall House, Stamford Street, London SE1 9NQ (UK)
- 1975- HAENNI, E. O., Dr.
7907 Glenbrook Road, Bethesda, Maryland 20014 (USA)
- 1973- KOJIMA, K., Dr.
Laboratory for Medicinal Plants, National Institute of Hygienic
Sciences, Higashi 2-8-65, Kasukabe, Kasukabe-shi, Saitama-ken
344 (Japan)
- 1971- MARCUSE, R., Dr.
SIK - Swedish Food Institute, Fack, S-400 21 Göteborg 16 (Sweden)
- 1975- SCHULLER, P. L., Dr.
Rijks Instituut voor de Volksgezondheid, Antonie van
Leeuwenhoeklaan 9, POB 1, Bilthoven (Netherlands)

*For Standing Orders, see page 129

FINANCE COMMITTEE (FC)*

(Established in its present form 1963)

Chairman

- 1967- BARRETT, J. W., Dr.
Monsanto Ltd., Monsanto House, 10-18 Victoria Street, London
SW1 0NQ (UK)
(TEL: 01-222-5678. TELEX: 916093)

Members

- 1971- BJÖRKMAN, A., Prof.
Langebakken 8, DK-2960 Rungsted Kyst (Denmark)
- 1975- GRAULICH, W., Dr.
Bayer AG, D-5090 Leverkusen Bayerwerk (Federal Republic of
Germany)
- 1975- MATHIEU, J., Prof.
Centre de Recherches Roussel Uclaf, 102 Route de Noisy, F-93230
Romainville (France)
- 1975- ROSSITER, B. W., Dr.
Chemistry Division, Research Laboratories, Eastman Kodak Co.,
1669 Lake Avenue, Rochester, New York 14650 (USA)
- 1973- ZAIKOV, G. E., Prof.
Institute of Chemical Physics, Academy of Sciences of USSR,
Vorobyevskoye Chaussée 2-b, 117334 Moscow (USSR)

Ex officio Member

- 1971- HORN, O., Prof.
Hoechst AG, Postfach 800320, D-6230 Frankfurt/Main 80
(Federal Republic of Germany)

*For Standing Orders, see page 130

INTERDIVISIONAL COMMITTEE ON MACHINE DOCUMENTATION IN THE CHEMICAL FIELD (IDCMD)*

(Established 1969)

Chairman

- 1969- DUBOIS, J. E., Prof.
Laboratoire de Chimie Organique Physique, Université de Paris
VII, 1 Rue Guy de la Brosse, F-75005 Paris Cedex 05 (France)
(TEL: 535-5606)

Secretary

- 1973- VEAL, D. C., Dr.
United Kingdom Chemical Information Service, University of
Nottingham, Nottingham NG7 2RD (UK)
(TEL: 0602-57411)

Members

- 1970- BOKII, G. B., Prof.
National Committee of Soviet Chemists, c/o Institute of Chemical
Physics, Academy of Sciences of USSR, Vorobyevskoye
Chaussée 2-b, 117334 Moscow (USSR)
- 1969- VAN EIJK VAN VOORTHUIJSEN, J. J. B., Dr.
Netherlands Organization for Chemical Information, c/o KNCV-
Secretariat, Burnierstraat 1, POB 1766, NL-2018 's-Gravenhage
(Netherlands)
- 1973- FUJIWARA, S., Prof.
Department of Chemistry, University of Tokyo, 3-1 Hongo
7-chome, Bunkyo-ku, Tokyo 113 (Japan)
- 1969- SCHENK, H. R., Dr.
Chemical Research, Pharmaceutical Division, Sandoz AG,
CH-4002 Basel (Switzerland)
- 1969- SUHR, C., Dr.
Patentabteilung/Dokumentation, BASF Aktiengesellschaft, D-6700
Ludwigshafen/Rhein (Federal Republic of Germany)
- 1969- TATE, F. A., Dr.
Chemical Abstracts Service, Ohio State University, POB 1378,
Columbus, Ohio 43210 (USA)

*For Standing Orders, see page 131

INTERDIVISIONAL COMMITTEE ON NOMENCLATURE AND SYMBOLS (IDCNS)*

(Established in its present form 1975)

Chairman

(To be appointed)

Vice-Chairman

- 1975-1979 LOZAC'H, N., Prof.
École Nationale Supérieure de Chimie, Université de Caen,
5 Avenue d'Edimbourg, F-14032 Caen (France)
(TEL: 31-815714)

Secretary

- 1975-1979 PAUL, M. A., Dr.
1772 Horatio Avenue, Merrick, New York 11566 (USA)
(TEL: 516-546-8362)

Scientific Editor

CULLIS, C. F., Prof.
Department of Chemistry, City University, St. John Street,
London EC1V 4PB (UK)

Clinical Chemistry Section

- 1975-1979 DYBKAER, R., Dr.
Department of Clinical Chemistry, Geriatric Unit, De Gamles By,
Nørre Allé 41, DK-2200 København N (Denmark)

Physical Chemistry Division

- 1975-1979 LIDE, Jr., D. R., Dr.
Office of Standard Reference Data, National Bureau of
Standards, US Department of Commerce, Washington,
DC 20234 (USA)

- 1975-1979 WHIFFEN, D. H., Prof.
Department of Physical Chemistry, School of Chemistry,
University of Newcastle upon Tyne, Newcastle upon Tyne NE1
7RU (UK)

Inorganic Chemistry Division

- 1975-1979 FERNELIUS, W. C., Prof.
Department of Chemistry, Kent State University, Kent, Ohio
44242 (USA)

- 1975-1979 GUTMANN, V., Prof.
Institut für Anorganische Chemie der Technischen Hochschule
Wien, Getreidemarkt 9, A-1060 Wien (Austria)

*For Standing Orders, see page 132

Organic Chemistry Division

- 1975-1979 KLESNEY, S. P., Mr.
Central Report Index, 566 Building, Dow Chemical Co. Midland,
Michigan 48640 (USA)
- 1975-1979 RIGAUDY, J., Prof.
Laboratoire de Recherches Organiques, École Supérieure de
Physique et de Chimie Industrielle, Université de Paris VI, 10 Rue
Vauquelin, F-75231 Paris Cedex 05 (France)

Macromolecular Division

- 1975-1979 LOENING, K. L., Dr.
Chemical Abstracts Service, Ohio State University, POB 1378,
Columbus, Ohio 43210 (USA)
- 1975-1979 RING, W., Dr.
Chemische Werke Hüls AG, Organische Abteilung, Postfach
1180, D-4370 Marl Kreis Recklinghausen (Federal Republic of
Germany)

Analytical Chemistry Division

- 1975-1979 IRVING, H. M. N. H., Prof.
1 North Grange Mount, Leeds LS6 2BY (UK)
- 1975-1979 SAMUELSON, O., Prof.
Institutionen för Teknisk Kemi, Chalmers Tekniska Högskola,
Gibraltargatan 5A, Fack, S-402 20 Göteborg 5 (Sweden)

Applied Chemistry Division

- 1975-1979 EGAN, H., Dr.
Laboratory of the Government Chemist, Department of Industry,
Cornwall House, Stamford Street, London SE1 9NQ (UK)
- 1975-1979 EPSTEIN, J. A., Dr.
Dead Sea Works Ltd., Potash House, POB 75, Beer-Sheba (Israel)

Bureau International des Poids et Mesures

TERRIEN, J., Prof.
Bureau International des Poids et Mesures, Pavillon de Breteuil,
F-92310 Sèvres (France)

International Company Associates Group

BARRETT, J. W., Dr.
Monsanto Ltd., Monsanto House, 10-18 Victoria Street, London
SW1H 0NQ (UK)

International Organization for Standardization

SIMONSGAARD, V., Mrs.
Secretariat of ISO/TC 12, Dansk Standardiseringsråd,
Aurehøjvej 12, POB 77, DK-2900 Hellerup (Denmark)

International Union of Biochemistry

HOFFMANN-OSTENHOF, O., Prof.
Institut für Allgemeine Biochemie der Universität Wien,
Währingerstrasse 38, A-1090 Wien (Austria)

International Union of Nutritional Sciences

AMES, S. R., Dr.

Health and Nutrition Research Division, Tennessee Eastman
Research Laboratories, POB 1911, Rochester, New York 14603
(USA)

International Union of Pure and Applied Physics

VILLENA, L., Prof.

Avenida de la Habana 147, Madrid-33 (Spain)

COMMITTEE ON SCOPE (CS)*

(Established 1971)

Chairman

1971-

GALLAY, W., Dr.

490 Cloverdale Road, Ottawa, Ontario K1M 0Y6 (Canada)
(TEL: 613-749-9563)

Members

(Revised membership under consideration)

*For Standing Orders, see page 127

IUB-IUPAC COMMISSION ON BIOCHEMICAL NOMENCLATURE (CBN)

*(Attached to Organic Chemistry and Macromolecular Divisions.
Established in its present form 1963)*

Chairman

- IUB HOFFMANN-OSTENHOF, O., Prof.
 Institut für Allgemeine Biochemie der Universität Wien,
 Währingerstrasse 38, A-1090 Wien (Austria)
 (TEL: 0222-344630)

Secretary

- IUPAC COHN, W. E., Dr.
1965-1977 Biology Division, Oak Ridge National Laboratory, POB Y, Oak
 Ridge, Tennessee 37830 (USA)
 (TEL: 615-483-8611)

Members

- IUB BRAUNSTEIN, A. E., Prof.
 Institute of Molecular Biology, Academy of Sciences of USSR,
 Ul. Vavilova 32, 117312 Moscow (USSR)
- IUPAC DIXON, H. B. F., Dr.
1975-1979 Department of Biochemistry, University of Cambridge, Tennis
 Court Road, Cambridge CB2 1QW (UK)
- IUB HORECKER, B. L., Dr.
 Roche Institute of Molecular Biology, Nutley, New Jersey 07110
 (USA)
- IUB JAKOBY, W. B., Dr.
 Room 9N-109, A-LBM Building 10, National Institutes of Health,
 US Department of Health, Education, and Welfare, Bethesda,
 Maryland 20014 (USA)
- IUPAC KARLSON, P., Prof.
1967-1977 Institut für Physiologische Chemie, Institutsgruppe Lahnberge der
 Medizinischen Fakultät der Philipps-Universität, D-3550
 Marburg/Lahn (Federal Republic of Germany)
- IUPAC KLYNE, W., Prof.
1965-1977 Department of Chemistry, Westfield College, Hampstead,
 London NW3 7ST (UK)
- IUB LIÉBECQ, C., Prof.
 1 Rue des Bonnes-Villes, B-4000 Liège (Belgium)
- IUPAC WEBB, E. C., Prof.
1967-1977 Macquarie University, North Ryde, Sydney, New South Wales
 (Australia 2113)

IUB-IUPAB-IUPAC COMMISSION ON BIOTHERMODYNAMICS

(Attached to Physical Chemistry Division, Established 1975)

Chairman

IUPAC
1975- WADSÖ, I., Prof.
Chemical Center, Thermochemistry, University of Lund, POB
740, S-220 07 Lund 7 (Sweden)
(TEL: 046-124600)

Members

IUPAC
1975- ARMSTRONG, G. T., Dr.
Thermochemical Measurements and Standards Section, National
Bureau of Standards, US Department of Commerce,
Washington, DC 20234 (USA)

IUPAB EDSALL, J. T., Prof.
Biological Laboratories, Harvard University, 16 Divinity Avenue,
Cambridge, Massachusetts 02138 (USA)

IUB GUTFREUND, H., Prof.
Laboratory of Molecular Enzymology, Department of
Biochemistry, University of Bristol, Woodland Road, Bristol BS8
1TD (UK)

IUPAB JENCKS, W. P., Prof.
Department of Biochemistry, Brandeis University, Waltham,
Massachusetts 02154 (USA)

IUB PRIVALOV, P., Dr.
Institute of Protein Research, Poustchino, Moscow (USSR)

IUPAC REPRESENTATIVES ON OTHER ORGANIZATIONS

ICSU General Committee

- 1973-1977 THOMPSON, Prof. Sir HAROLD
St. John's College, Oxford OX1 3JP (UK)
(TEL: 0865-47671)

ICSU Abstracting Board (IAB)

- 1973-1977 BARRETT, J. W., Dr.
Monsanto Ltd., Monsanto House, 10-18 Victoria Street, London
SW1H 0NQ (UK)
(TEL: 01-222-5678. TELEX: 916093)

ICSU Committee on Data for Science and Technology (CODATA)

- 1974-1977 WHIFFEN, D. H., Prof.
Department of Physical Chemistry, School of Chemistry,
University of Newcastle upon Tyne, Newcastle upon Tyne NE1
7RU (UK)
(TEL: 0632-28511)

ICSU Committee on Teaching of Science (CTS)

- 1969-1977 CHISMAN, D. G., Mr.
British Council, 10 Spring Gardens, London SW1A 2BN (UK)
(TEL: 01-930-8466)

ICSU Scientific Committee on Problems of the Environment (SCOPE)

- 1970-1977 GALLAY, W., Dr.
490 Cloverdale Road, Ottawa, Ontario K1M 0Y6 (Canada)
(TEL: 613-749-9563)

Inter-Union Commission on Spectroscopy (IUCS)

- 1971-1977 COLE, A. R. H., Prof.
School of Chemistry, University of Western Australia, Nedlands,
Western Australia (Australia 6009)
- 1971-1977 MORINO, Y., Prof.
Sagami Chemical Research Center, 4-1, 4-chome, Nishionuma,
Sagamihara-shi, Kanagawa 229 (Japan)
- 1975-1981 ELYASHÉVICH, M. A., Prof.
Faculty of Physics, Byelorussian State University, Minsk (USSR)
- 1975-1981 SHEPPARD, N., Prof.
School of Chemical Sciences, University of East Anglia,
University Plain, Norwich NR4 7TJ (UK)

International Association for Cereal Chemistry (ICC)

- 1973-1977 PARISI, F., Dr.
Società Chimica Italiano—Sezione Lombardo, Piazzale Rodolfo
Morandi 2, I-20121 Milano (Italy)
(TEL: 02-781041)

International Federation of Clinical Chemistry (IFCC)

- 1975-1977 LOUS, P., Prof.
Department of Clinical Chemistry, Bispebjerg Hospital,
Bispebjerg Bakke 23, DK-København NV (Denmark)
(TEL: 01-TAgA-1250)
- 1975-1977 GRÄSBECK, R., Dr.
Minerva Foundation Institute for Medical Research, POB 819,
SF-00101 Helsinki 10 (Finland)
(TEL: 90-500122)

Comité Consultatif des Unités de Comité International des Poids et Mesures

ISO/TC 12: Quantities, Symbols, Conversion Factors, and Conversion Tables

ISO/TC 12/SC 2: General Rules for Use of SI Units, Their Multiples and Submultiples in Various Industries

- 1970-1977 McGLASHAN, M. L., Prof.
Department of Chemistry, University College, London, 20
Gordon Street, London WC1H 0AJ (UK)
(TEL: 01-387-7050)

FECS Working Party on Analytical Chemistry

- 1974-1977 WEST, T. S., Prof.
Macaulay Institute for Soil Research, Craigiebuckler, Aberdeen
AB9 2QJ (UK)
(TEL: 0224-38611)

SECTION ON CLINICAL CHEMISTRY (CCS)

(Established in its present form 1975)

SECTION COMMITTEE

President

- 1967-1977 LOUS, P., Prof.
Department of Clinical Chemistry, Bispebjerg Hospital,
Bispebjerg Bakke 23, DK-2400 København NV (Denmark)
(TEL: 01-TAga-1250)

Vice-President (President Elect)

- 1971-1977 ROTH, M., Dr.
Laboratoire Central, Hôpital Cantonal,
CH-1211 Genève 4 (Switzerland)
(TEL: 022-469211. TELEX: 27588)

Past-President

- 1967-1977 TONKS, D. B., Prof.
Division of Clinical Chemistry, Montreal General Hospital,
1650 Cedar Avenue, Montreal, Quebec H3G 1A4 (Canada)
(TEL: 514-937-6011)

Secretary

- 1971-1979 GRÄSBECK, R., Dr.
Minerva Foundation Institute for Medical Research,
POB 819, SF-00101 Helsinki 10 (Finland)
(TEL: 90-500122)

Members

- 1971-1979 CURNOW, D. H., Prof.
Department of Clinical Biochemistry, Perth Medical Centre,
Shenton Park, Western Australia (Australia 6008)
- 1973-1977 DYBKAER, R., Dr.
Department of Clinical Chemistry, Geriatric Unit, De Gamles By,
Nørre Allé 41, DK-2200 København N (Denmark)
- 1971-1979 SUNDERMAN, Jr., F. W., Prof.
Department of Laboratory Medicine, School of Medicine,
University of Connecticut POB G, Farmington, Connecticut
06032 (USA)
- 1973-1977 WHITEHEAD, T. P., Prof.
Department of Clinical Chemistry, Queen Elizabeth Medical
Centre, Edgbaston, Birmingham B15 2TH (UK)
- 1975-1979 YOUNG, D. S., Dr.
Clinical Chemistry Service, Clinical Pathology Department
National Institutes of Health, US Department of Health,
Education, and Welfare, Bethesda, Maryland 20014 (USA)
- 1975-1979 ZENDER, R., Dr.
Laboratoire, Hôpital de la Chaux-de-Fonds,
CH-2301 La Chaux-de-Fonds (Switzerland)

Coopted Members

BROUGHTON, P. M. G., Mr.

University Department of Chemical Pathology, General Infirmary,
Leeds LS1 3EX (UK)

CERIOTTI, G., Prof.

Ospedale, Padova (Italy)

FREI, J., Prof.

Laboratoire Central, Hôpital Cantonal,
CH-1011 Lausanne (Switzerland)

HOMOLKA, J., Prof.

Czechoslovak Society of Clinical Chemistry,
Karlovo náměstí 32, Praha 2 (Czechoslovakia)

VAN KAMPEN, E. J., Dr.

Klinisch Chemisch Laboratorium, Diakonessenhuis,
V. Ketw. Verschuurlaan 82, Groningen (Netherlands)

MENSHIKOV, V. V., Prof.

All-Union Scientific Methodical Centre for Laboratory Research,
Rossolimo 11, Moscow (USSR)

MITCHELL, F. L., Dr.

Division of Clinical Chemistry, Clinical Research Centre,
Northwick Park Hospital, Watford Road, Harrow HA1 3UJ,
Middlesex (UK)

NIXON, J. C., Dr.

Medical Data Services Ltd., 30 Meridian Road, Rexdale, Ontario
M9W 4Z9 (Canada)

PURDY, W. C., Prof.

Department of Chemistry, University of Maryland,
College Park, Maryland 20742 (USA)

STAMM, D., Prof.

Max-Planck-Institut für Psychiatrie, Kraepelinstrasse 10, D-8000
München 40 (Federal Republic of Germany)

National Representatives

Australia
1972-1977

NEALE, F. C., Dr.

Kanematsu Memorial Institute, Sydney Hospital,
Sydney, New South Wales

Austria
1969-1977

KAISER, E., Prof.

Medizinisch-Chemisches Institut der Universität Wien,
Währingerstrasse 10, A-1090 Wien IX

Belgium
1972-1977

DE LEENHEER, A., Prof.

Laboratorium voor Medische, Biochemie en Klinische Analyse,
Fakulteit der Farmaceutische Wetenschappen, Rijksuniversiteit-
Gent, De Pintelaan 135, B-9000 Ghent

Denmark
1975-1977

WORSAAE, U., Mr.

Medicinsk Laboratorium A/S,
Adelgade 5-7, DK-1304 København K

- Federal Republic of Germany* BREUER, H., Prof.
Institut für Klinische Biochemie der Rheinischen Friedrich-Wilhelms-Universität Bonn, D-5300 Bonn 1, Venusberg
1972-1977
- Finland* ADLERCREUTZ, H., Prof.
1969-1977 Department of Clinical Chemistry, Meilahti Hospital, SF-00290 Helsinki 29
- France* LEMMONIER, A., Dr.
1967-1977 Laboratoire Central de Biochemie, Hôpital de Bicêtre, F-94 Kremlin-Bicêtre
- Hungary* RINGELHANN, B., Dr.
1973-1977 Országos Rheuma és Fizioterápiás Intézet, Frankel Léo Utca 17-19, Postaffok 54, H-1525 Budapest 114
- Italy* DE ANGELIS, G., Prof.
1976-1977 Istituto di Chimica Analitica dell'Università di Roma, Piazzale delle Scienze, I-00161 Roma
- Japan* YAMAMURA, Y., Prof.
1967-1977 Third Department of Internal Medicine, Osaka University Hospital, Fukushima-ku, Osaka
- Mexico* DE SANCHEZ, M. L. C.
1969-1977 Mexican Association of Clinical Biochemistry, Apartado Postal 24-498, México 7, DF
- Norway* FOSS, O. P., Dr.
1969-1977 Department of Clinical Chemistry, Ulleval Hospital, Oslo 3
- Poland* KRAWCZYNSKI, J., Prof.
1969-1977 Polskie Towarzystwo Diagnostyki Laboratoryjnej, Ul. Cegłowska 80, Warszawa
- Sweden* LINSTEDT, S., Prof.
1973-1977 Department of Clinical Chemistry, Sahlgren's Hospital, S-413 45 Göteborg
- Union of Soviet Socialist Republics* OREKHOVICH, V. M., Prof.
1967-1977 Institute of Biological and Medical Chemistry, Academy of Medical Sciences of USSR, Pogodin Chaussée 10, Moscow G-117
- United States of America* SCHWARTZ, M. K., Dr.
1975-1977 Sloane-Kettering Institute, Memorial Hospital for Cancer and Allied Diseases, 444 East 68th Street, New York, New York 10021

Representatives of IFCC

President

FREI, J., Prof.
Laboratoire Central, Hôpital Cantonal,
CH-1011 Lausanne (Switzerland)

Secretary

BROUGHTON, P. M. G., Mr.
University Department of Chemical Pathology, General Infirmary, Leeds LS1 3EX (UK)

Representative of IUB

LUNDQUIST, F., Prof.

Department of Biochemistry A, Panum Institute, University of
Copenhagen, Blegdamsvej 3C, DK-2200 København N (Denmark)

COMMISSION ON AUTOMATION (CACC)

(Established 1967)

Titular Members

Chairman

- 1971-1977 YOUNG, D. S., Dr.
Clinical Chemistry Service, Clinical Pathology Department
National Institutes of Health, US Department of Health,
Education, and Welfare, Bethesda, Maryland 20014 (USA)
(TEL: 301-496-3386)

Members

- 1975-1979 BIERENS DE HAAN, J., Dr.
Laboratoire Riotton SA, 16 Boulevard des Tranchées, CH-1206
Genève (Switzerland)
- 1973-1977 BÜTTNER, J., Prof.
Institut für Klinische Chemie, Medizinische Hochschule Hannover,
Karl-Wiechert-Allee 9, D-3000 Hannover-Kleefeld (Federal
Republic of Germany)
- 1973-1977 HJELM, M., Prof.
Department of Clinical Chemistry, University Hospital,
DK-5000 Odense (Denmark)

Associate Member

- 1975-1979 WHITEHEAD, T. P., Prof.
Department of Clinical Chemistry, Queen Elizabeth Medical
Centre, Edgbaston, Birmingham B15 2TH (UK)

COMMISSION ON QUANTITIES AND UNITS (CQUCC)

(Established 1967)

Titular Members

Chairman

- 1975-1979 ZENDER, R., Dr.
Laboratoire, Hôpital de la Chaux-de-Fonds,
CH-2301 La Chaux-de-Fonds (Switzerland)
(TEL: 039-211191)

Secretary

- 1973-1977 RIGG, J. C., Mr.
Centre for Agricultural Publishing and Documentation,
17 Marijkeweg, POB 4, NL-6140 Wageningen (Netherlands)
(TEL: 08370-19146)

Members

- 1967-1977 DYBKAER, R., Dr.
Department of Clinical Chemistry, Geriatric Unit, De Gamles By,
Nørre Allé 41, DK-2200 København N (Denmark)
- 1971-1979 HERRMANN, R., Prof.
Abteilung für Medizinische Physik, Am Schlangenzahl 29, D-6300
Giessen (Federal Republic of Germany)
- 1975-1979 SIGGAARD-ANDERSEN, O., Prof.
Department of Clinical Chemistry, Copenhagen County Hospital,
Turkisvej, DK-2730 Herlev (Denmark)

Associate Members

- 1975-1979 ARMBRECHT, B. H., Dr.
Department of Pharmacology, School of Dentistry,
University of Maryland, Baltimore, Maryland 21201 (USA)
- 1975-1979 JØRGENSEN, K., Dr.
Klinisk-Kemisk Afdeling CL 3011, Rigshospitalet,
Blegdamsvej 9, DK-2100 København Ø (Denmark)
- 1975-1979 MÉTAIS, P., Prof.
Laboratoire de Chimie Biologique, Faculté de Pharmacie de
Strasbourg, 3 Rue de l'Argonne, F-67083 Strasbourg (France)

COMMISSION ON TEACHING (CTeCC)

(Established 1967)

Titular Members

Chairman

- 1973-1977 CURNOW, D. H., Prof.
Department of Clinical Biochemistry, Perth Medical Centre,
Shenton Park, Western Australia (Australia 6008)
(TEL: 80-1122)

Secretary

- 1975-1979 PORTER, C. J., Dr.
Department of Clinical Biochemistry, Toronto General Hospital,
101 College Street, Toronto 2, Ontario (Canada)
(TEL: 416-595-3283)

Members

- 1967-1977 LOUS, P., Prof.
Department of Clinical Chemistry, Bispebjerg Hospital,
Bispebjerg Bakke 23, DK-2400 København NV (Denmark)
- 1971-1979 ROTH, M., Dr.
Laboratoire Central, Hôpital Cantonal,
CH-1211 Genève 4 (Switzerland)
- 1975-1979 SCHWARTZ, M. K., Dr.
Sloane-Kettering Institute, Memorial Hospital for Cancer and
Allied Diseases, 444 East 68th Street, New York, New York 10021
(USA)

Associate Members

- 1975-1979 ABDEL KADER, M. M., Prof.
Department of Biochemistry, Faculty of Medicine, Cairo
University, Kasr El Fini Street, Cairo (Arab Republic of Egypt)
- 1971-1977 DEFALQUE, A., Prof.
8 Avenue Géo Bernier, B-1050 Bruxelles (Belgium)
- 1975-1979 LATNER, A. L., Prof.
Department of Clinical Biochemistry, Royal Victoria Infirmary,
Newcastle upon Tyne NE1 7RU (UK)
- 1975-1979 LOUISOT, P., Prof.
Laboratoire de Biochimie, UER Médecine,
BP 12, F-69600 Oullins (France)
- 1975-1979 RUBIN, M., Prof.
Department of Biochemistry, School of Medicine,
Georgetown University Hospital, 3800 Reservoir Road NW,
Washington, DC 20007 (USA)

COMMISSION ON TOXICOLOGY (CToCC)

(Established 1973)

Titular Members

Chairman

- 1973-1977 SUNDERMAN, Jr., F. W., Prof.
Department of Laboratory Medicine, School of Medicine,
University of Connecticut, POB G, Farmington, Connecticut
06032 (USA)
(TEL: 203-674-2328)

Secretary

- 1973-1977 BOURDON, R., Prof.
Laboratoire de Biochemie-Toxicologie, Centre Anti-Poison
d'Hôpital Fernand Widal, 200 Rue du Faubourg Saint-Denis,
F-75013 Paris 10^e (France)
(TEL: 205-6329)

Members

- 1973-1977 BROWN, S. S., Dr.
Division of Clinical Chemistry, Clinical Research Centre,
Northwick Park Hospital, Watford Road, Harrow HA1 3UJ,
Middlesex (UK)
- 1974-1977 MERCIER, M. J., Prof.
Sentier du Biéreau 13, B-1348 Louvain-La-Neuve (Belgium)

Associate Members

- 1974-1977 NOIRFALISE, A., Dr.
Laboratoires de Toxicologie, Université de Liège,
151 Boulevard de la Constitution, B-4000 Liège (Belgium)
- 1974-1977 SAVORY, J., Dr.
Clinical Chemistry Laboratory, North Carolina Memorial Hospital,
Chapel Hill, North Carolina 27514 (USA)
- 1974-1977 SPIEGEL, H. E., Dr.
Clinical Biochemistry Laboratory, Hoffmann-La Roche Inc.,
Kingsland Street, Nutley, New Jersey 07110 (USA)
- 1974-1977 TONKS, D. B., Prof.
Division of Clinical Chemistry, Montreal General Hospital,
1650 Cedar Avenue, Montreal, Quebec H3G 1A4 (Canada)

SUBCOMMITTEE ON ENVIRONMENTAL AND OCCUPATIONAL TOXICOLOGY OF NICKEL

Chairman

SUNDERMAN, Jr., F. W., Prof.

Department of Laboratory Medicine, School of Medicine,
University of Connecticut, POB G, Farmington, Connecticut
06032 (USA)

(TEL: 203-674-2328)

Members

BROWN, S. S., Dr.

Division of Clinical Chemistry, Clinical Research Centre,
Northwick Park Hospital, Watford Road, Harrow HA1 3UJ,
Middlesex (UK)

CLARY, J. J., Dr.

Inhalation Toxicology Section, Haskell Laboratory,
E I du Pont de Nemours and Co. Ltd.,
Wilmington, Delaware 19898 (USA)

KASPRZAK, K., Dr.

Instytut Chemii Podstawowej, Politechnika Poznańska,
Ul. Piotrowo 3, Skrytka Pocztaowa Nr 5, PL 60-965 Poznań
(Poland)

McNEELY, M. D. D., Dr.

Mount Sinai Hospital, 600 University Avenue, Toronto, Ontario
M5G 1X5 (Canada)

MEININGER, J., Dr.

Services Medicaux, Société Le Nickel, 1 Boulevard de Vaugirard,
F-75751 Paris Cedex 15 (France)

MORGAN, L., Dr.

Medical Department, International Nickel Co. Ltd.,
Clydach, Swansea SA6 5QR (UK)

NOMOTO, S., Dr.

Division of Clinical Chemistry, School of Medical Technology,
Shinshu University, 1308 Asama, Matsumoto 390 03 (Japan)

NORSETH, T., Dr.

Institute of Occupational Health, Yrkeshygienisk Institutt,
Gydas Vei 8, POB 8149, Oslo Dep., Oslo 1 (Norway)

STOEPLER, M., Dr.

Institut für Chemie der Kernforschungsanlage Jülich GmbH,
Postfach 1913, D-5170 Jülich (Federal Republic of Germany)

ZACHARIASEN, H., Dr.

Falconbridge Nikkelverk Aktieselskap,
POB 457, N-4601 Kristiansand S (Norway)

(Established 1949)

DIVISION COMMITTEE

President

- 1969-1977 JONES, R. N., Dr.
Division of Chemistry, National Research Council of Canada,
Ottawa, Ontario K1A 0R6 (Canada)
(TEL: 613-992-4769. TELEX: 053 3145 NRC ADMIN OTT)

Past-President

- 1963-1977 WADDINGTON, G., Dr.
Ocean Villa Apartment 401, 20 Olympia Avenue,
Victoria, British Columbia V8V 2N4 (Canada)
(TEL: 604-384-3264)

Vice-President

- 1969-1977 SUNNER, S., Prof.
Chemical Center, Thermochemistry, University of Lund,
POB 740, S-220 07 Lund 7 (Sweden)
(TEL: 046-124600)

Secretary

- 1973-1977 FAYARD, M., Prof.
École Nationale Supérieure de Chimie, Université de Paris VI,
11 Rue Pierre et Marie Curie, F-75231 Paris Cedex 05 (France)
(TEL: 336-2525)

Members

- 1975-1979 AMBROSE, D., Dr.
Division of Chemical Standards, National Physical Laboratory,
Department of Industry, Teddington TW11 0LW, Middlesex
(UK)
- 1973-1977 GURVICH, L. V., Prof.
Institute for High Temperatures, Academy of Sciences of USSR,
Korovinskoye Chaussée, 127412 Moscow (USSR)
- 1973-1977 HAASE, R., Prof.
Melatener Strasse 107, D-5100 Aachen (Federal Republic of
Germany)
- 1975-1979 MYSELS, K. J., Dr.
General Atomic Co., POB 81608, San Diego, California 92138
(USA)
- 1975-1979 SHEPPARD, N., Prof.
School of Chemical Sciences, University of East Anglia,
University Plain, Norwich NR4 7TJ (UK)
- 1973-1977 WESTRUM, Jr., E. F., Prof.
Department of Chemistry, University of Michigan,
Ann Arbor, Michigan 48104 (USA)

I.1 COMMISSION ON PHYSICOCHEMICAL SYMBOLS, TERMINOLOGY, AND UNITS

(Established in its present form 1936)

Titular Members

Chairman

- 1971-1979 WHIFFEN, D. H., Prof.
Department of Physical Chemistry, School of Chemistry,
University of Newcastle upon Tyne, Newcastle upon Tyne NE1
7RU (UK)
(TEL: 0632-28511)

Secretary

- 1971-1979 WEIL, K. G., Prof.
Fachgebiet Elektrochemie, Institut für Physikalische Chemie der
Technischen Hochschule Darmstadt, Petersenstrasse 15, D-6100
Darmstadt (Federal Republic of Germany)
(TEL: 06151-162498)

Members

- 1975-1979 ANSARA, I., Dr.
Laboratoire de Thermodynamique, Domaine Universitaire,
F-38400 Saint Martin d'Heres (France)
- 1973-1977 KELLÖ, V., Prof.
Slovak Academy of Sciences, Obráncov Mieru 41, CS-800 00
Bratislava (Czechoslovakia)
- 1971-1979 KOEFOED, J., Prof.
Department of Physical Chemistry, Technical University of
Denmark, Building 206, DK-2800 Lyngby (Denmark)
- 1971-1979 LIDE, Jr., D. R., Dr.
Office of Standard Reference Data, National Bureau of
Standards, US Department of Commerce, Washington,
DC 20234 (USA)
- 1971-1979 SCHUIJFF, A., Dr.
Laboratorium voor Algemene Chemie, Transitorium III,
Universiteitscentrum "Uithof" Padualaan 8, Utrecht
(Netherlands)

Associate Members

- 1971-1977 McGLASHAN, M. L., Prof.
Department of Chemistry, University College London,
20 Gordon Street, London WC1H 0AJ (UK)
- 1973-1977 PAUL, M. A., Dr.
1772 Horatio Avenue, Merrick, New York 11566 (USA)
- 1975-1979 PEREZ-MASIÁ, A., Prof.
Instituto de Química Física 'Rocasolano', Consejo Superior de
Investigaciones Científicas Serrano 119, Madrid-6 (Spain)

1969-1977 TERRIEN, J., Prof.
Bureau International des Poids et Mesures,
Pavillon de Breteuil, F-92310 Sèvres

I.2 COMMISSION ON THERMODYNAMICS AND THERMOCHEMISTRY

(Established in its present form 1961)

Titular Members

Chairman

- 1969-1977 WESTRUM, Jr., E. F., Prof.
Department of Chemistry, University of Michigan,
Ann Arbor, Michigan 48104 (USA)
(TEL: 313-764-735)

Secretary

- 1973-1977 LAFFITTE, M., Prof.
Centre de Recherches de Microcalorimétrie et de Thermochimie
du Centre National de la Recherche Scientifique,
26 Rue du 141^e RIA, F-13003 Marseille (France)
(TEL: 91-627874. TELEX: 420425 F OREM 120)

Members

- 1973-1977 BECKETT, C. W., Dr.
Physical Chemistry Division, National Bureau of Standards,
US Department of Commerce, Washington, DC 20234 (USA)
- 1969-1977 COX, J. D., Dr.
Division of Chemical Standards, National Physical Laboratory,
Department of Industry, Teddington TW11 0LW, Middlesex
(UK)
- 1969-1977 GURVICH, L. V., Prof.
Institute for High Temperatures, Academy of Sciences of USSR,
Korovinskoye Chaussée, 127412 Moscow (USSR)
- 1975-1979 SCHNEIDER, G. M., Prof.
Institut für Physikalische Chemie der Ruhr-Universität Bochum,
D-4630 Bochum-Querenburg (Federal Republic of Germany)
- 1975-1979 TAKAHASHI, Y., Prof.
Department of Nuclear Engineering, Faculty of Engineering,
University of Tokyo, 3-1 Hongo 7-chome, Bunkyo-ku, Tokyo
113 (Japan)
- 1973-1977 WADSÖ, I., Prof.
Chemical Center, Thermochemistry, University of Lund,
POB 740, S-220 07 Lund 7 (Sweden)

Associate Members

- 1973-1977 ANGUS, S., Dr.
Department of Chemical Engineering and Chemical Technology,
Imperial College of Science and Technology,
South Kensington, London SW7 2BY (UK)
- 1973-1977 BREWER, L., Prof.
Department of Chemistry, University of California,
Berkeley, California 94720 (USA)

- 1975-1979 DIAZ-PEÑA, M., Prof.
Departamento de Química Física, Facultad de Ciencias,
Universidad Complutense, Madrid-3 (Spain)
- 1975-1979 FRANZOZINI, P., Prof.
Istituto di Elettrochimica dell'Università di Pavia,
Viale Taramelli 16, I-27100 Pavia (Italy)
- 1973-1977 KOHLER, F., Prof.
Institut für Thermo- und Fluidodynamik der Ruhr-Universität
Bochum, Postfach 2148, D-4630 Bochum-Querenberg (Federal
Republic of Germany)
- 1975-1979 VANDERZEE, C. E., Prof.
Department of Chemistry, University of Nebraska,
Lincoln, Nebraska 68508 (USA)
- 1973-1977 WHALLEY, E., Dr.
Division of Chemistry, National Research Council of Canada,
Ottawa, Ontario K1A 0R9 (Canada)
- 1975-1979 ZIELENKIEWICZ, W., Prof.
Instytut Chemii Fizycznej, Polska Akademii Nauk,
Ul. Kasprzaka 44-52, PL-01 224 Warszawa (Poland)

National Representatives

- German* RÄTZSCH, M., Prof.
Democratic Sektion Verfahrenscheme, Technische Hochschule "Carl
Republic Schorlemmer", Geusaer Strasse, 42 Merseburg
1975-1977
- New* WILLIAMSON, A. G., Dr.
Zealand Department of Chemical Engineering, University of Canterbury,
1973-1977 Private Bag, Christchurch

SUBCOMMITTEE ON PLASMA CHEMISTRY

Chairman

SUHR, H., Prof.

Chemisches Institut der Universität Tübingen, Auf der
Morgenstelle, D-7400 Tübingen 1 (Federal Republic of Germany)
(TEL: 07122-292480)

Members

BECKETT, C. W., Dr.

Physical Chemistry Division, National Bureau of Standards,
US Department of Commerce, Washington, DC 20234 (USA)

BELL, A. T., Prof.

Department of Chemical Engineering, University of California,
Berkeley, California 94720 (USA)

BONET, C., Dr.

Laboratoire des Ultra-Réfractaires, Centre National de la
Recherche Scientifique, BP 5, Odeillo, F-66120 Font-Romeu
(France)

ELYASHÉVICH, M. A., Prof.

Faculty of Physics, Byelorussian State University Minsk (USSR)

FAUCHAIS, P., Prof.

Laboratoire de Thermodynamique, UER des Sciences,
123 Rue A Thomas, F-87100 Limoges (France)

GAUVIN, W. H., Dr.

Research and Development, Noranda Research Centre,
240 Hymus Boulevard, Pointe Claire 730, Quebec (Canada)

LAPWORTH, K. C., Dr.

Division of Quantum Metallurgy, National Physical Laboratory,
Department of Industry, Teddington TW11 0LW, Middlesex
(UK)

MATSUMOTO, O., Prof.

Department of Chemistry, College of Science and Engineering,
Aoyama Gakuin University, 6-16-1, Chitosedai, Setagaya-ku,
Tokyo 154 (Japan)

McTAGGART, F. K., Dr.

Department of Electrical Engineering, University of Sydney,
Sydney, New South Wales (Australia 2006)

MOLINARI, E., Prof.

Istituto di Chimica, Citta Universitaria, I-00185 Roma (Italy)

POLAK, L. S., Prof.

Institute of Petrochemical Synthesis, Academy of Sciences of USSR,
Leninskii Prospect 29, Moscow V-71 (USSR)

SUBCOMMITTEE ON THERMODYNAMIC TABLES

Chairman

COX, J. D., Dr.

Division of Chemical Standards, National Physical Laboratory,
Department of Industry, Teddington TW11 0LW, Middlesex (UK)
(TEL: 01-977-3222. TELEX: 2623-44)

Secretary

WHITE, Jr., H. J., Dr.

Office of Standard Reference Data, National Bureau of Standards,
US Department of Commerce, Washington, DC 20234 (USA)
(TEL: 301-921-2581)

Members

ANGUS, S., Dr.

Department of Chemical Engineering and Chemical Technology,
Imperial College of Science and Technology,
South Kensington, London SW7 2BY (UK)

BAEHR, H. D., Prof.

Fachbereich Maschinenbau/Thermodynamik, Hochschule der
Bundeswehr Hamburg, Holstenhofweg 85, D-2000 Hamburg 70
(Federal Republic of Germany)

KEHIAIAN, H., Dr.

Centre de Recherches de Microcalorimetrie et de Thermochemie
du Centre National de la Recherche Scientifique,
26 Rue du 141^e RIA, F-13003 Marseille (France)

ROWLINSON, J. S., Prof.

Physical Chemistry Laboratory, University of Oxford,
South Parks Road, Oxford OX1 3QZ (UK)

SYTCHEV, V. V., Prof.

All-Union Scientific Research Institute of Metrological Service,
Ezdakov Pereulok 1, 117334 Moscow (USSR)

I.3 COMMISSION ON ELECTROCHEMISTRY

(Established 1951)

Titular Members

Chairman

- 1971-1979 IBL, N., Prof.
Technisch-Chemisches Laboratorium der Eidgenössischen
Technischen Hochschule, Universitätstrasse 6, CH-8006 Zürich
(Switzerland)
(TEL: 01-326211)

Vice-Chairman

- 1971-1979 PARSONS, R., Dr.
Department of Physical Chemistry, School of Chemistry,
University of Bristol, Cantock's Close, Bristol BS8 1TS (UK)
(TEL: 0272-24161)

Secretary

- 1975-1979 JUSTICE, J. C., Dr.
Laboratoire d'Electrochimie, Batiment F, Université de Paris VI,
4 Place Jussieu, F-75005 Paris (France)
(TEL: 336-2525)

Members

- 1975-1979 HEUSLER, K. E., Prof.
Abteilung Korrosion, Technische Universität, D-3392 Clausihal
Zellerfeld (Federal Republic of Germany)
- 1975-1979 KŮTA, J., Prof.
Ústav Fyzikální Chemie a Elektrochemie J Heyrovského,
Československá Akademie Věd, Vlašská 9, CS-118 40 Praha
1-Malá Strana (Czechoslovakia)
- 1969-1977 SANFELD, A., Prof.
Chimie Physique II, Faculté des Sciences, Université Libre de
Bruxelles, 50 Avenue F D Roosevelt, B-1050 Bruxelles (Belgium)
- 1975-1979 TRASATTI, S., Prof.
Laboratorio di Elettrochimica e Metallurgia dell'Università di
Milano, Via G Venezian 21, I-20133 Milano (Italy)
- 1971-1979 YEAGER, E., Prof.
Department of Chemistry, Case Western Reserve University,
10900 Euclid Avenue, Cleveland. Ohio 44106 (USA)

Associate Members

- 1971-1979 DURST, R. A., Dr.
Analytical Chemistry Division, National Bureau of Standards,
US Department of Commerce, Washington, DC 20234 (USA)

- 1975-1979 EPELBOIN, I., Prof.
Laboratoire de Physique des Liquides et Electrochimie du
Centre National de la Recherche Scientifique, 4 Place Jussieu,
Tour 22, F-75230 Paris Cedex 05 (France)
- 1975-1979 FROMENT, M., Dr.
Laboratoire de Physique des Liquides et Electrochimie,
Université Pierre et Marie Curie, 4 Place Jussieu, Tour 22, F-75230
Paris Cedex 05 (France)
- 1975-1979 HAASE, R., Prof.
Melatener Strasse 107, D-5100 Aachen (Federal Republic of
Germany)
- 1975-1979 HOLTAN, H., Prof.
Laboratories of Industrial Electrochemistry, University of
Trondheim-Norwegian Institute of Technology, N-7034
Trondheim-NTH (Norway)
- 1975-1979 NIKI, K., Dr.
Department of Electrochemistry, Yokohama National University,
Ohoka Minami-ku, Yokohama 233 (Japan)
- 1975-1979 TAMAMUSHI, R., Dr.
Institute of Physical and Chemical Research, 2-1 Hirosawa,
Wako-shi, Saitama 351 (Japan)

National Representatives

- Hungary* ERDEY-GRÚZ, T., Prof.
1969-1977 Eötvös Loránd Tudományegyetem Fizikai-Kémiai és Radiológiai
Tanszéke Puskin Utca 11-13, H-1088 Budapest VIII
- New Zealand* TOMLINSON, J. W., Prof.
1973-1977 Department of Chemistry, Victoria University of Wellington,
POB 196 Wellington
- Poland* MINČ, S., Prof.
1959-1977 Katedra Chemii Fizycznej, Uniwersytet Warszawski,
Ul. Pasteura 1, PL 02-093 Warszawa
- Spain* RIUS-MIRÓ, A., Prof.
1959-1977 Instituto de Química Física 'Rocasolano', Consejo Superior de
Investigaciones Científicas, Serrano 119, Madrid-6
- Yugoslavia* KARSULIN, M., Prof.
1959-1977 Institute of Physical Chemistry, Technical University, Maruliceva
Trg. 20, Zagreb

I.4 COMMISSION ON PHYSICOCHEMICAL MEASUREMENTS AND STANDARDS

(Established in its present form 1953)

Titular Members

Chairman

- 1971-1979 AMBROSE, D., Dr.
Division of Chemical Standards, National Physical Laboratory,
Department of Industry, Teddington TW11 0LW, Middlesex (UK)
(TEL: 01-977-3222. TELEX: 262344)

Vice-Chairman and Secretary

- 1973-1977 BRUNNER, E., Dr.
BASF Aktiengesellschaft, Ammoniaklaboratorium WAA/M325,
D-6700 Ludwigshafen/Rhein (Federal Republic of Germany)
(TEL: 0621-604559. TELEX: 464680)

Members

- 1975-1979 FEUERBERG, H., Prof.
Bundesanstalt für Materialprüfung, Unter den Eichen 87,
D-1000 Berlin 45 (Federal Republic of Germany)
- 1975-1979 JUHÁSZ, E., Dr.
National Office of Measurements, Németsölgyi Út 37, H-1124
Budapest XII (Hungary)
- 1973-1977 LANE, J. E., Dr.
Division of Applied Organic Chemistry, Commonwealth
Scientific and Industrial Research Organization, POB 4331,
Melbourne, Victoria (Australia 3001)
- 1975-1979 MILAZZO, G., Prof.
Laboratorio di Chimica, Istituto Superiore di Sanità,
Viale Regina Elena 299, I-00161 Roma (Italy)
- 1973-1977 PLEBANSKI, T., Prof.
Division of Physicochemical Metrology, Polish Committee for
Standardization and Measures, Ul. Elektoralna 2, PL 00-139
Warszawa (Poland)
- 1973-1977 TERRIEN, J., Prof.
Bureau International des Poids et Mesures,
Pavillon de Breteuil, F-92310 Sèvres (France)

Associate Members

- 1975-1979 CALADO, J. C. G., Prof.
Complexo Interdisciplinar, Instituto Superior Técnico,
Avenida Rovisco Pais, Lisboa-1 (Portugal)
- 1975-1979 CALI, J. P., Mr.
National Bureau of Standards, US Department of Commerce,
Washington, DC 20234 (USA)

- 1975-1979 GRAHAM, R. P., Dr.
General Sciences Building, McMaster University, Hamilton,
Ontario (Canada)
- 1973-1977 KIENITZ, H., Prof.
BASF Aktiengesellschaft, Forschung WOH/B1, D-6700
Ludwigshafen/Rhein (Federal Republic of Germany)
- 1975-1979 MARSH, K. N., Dr.
Department of Physical and Inorganic Chemistry, University of
New England, Armidale, New South Wales (Australia 2350)
- 1975-1979 NEWTON, A., Mr.
Petrochemicals Division, Imperial Chemical Industries Ltd.,
POB 190, Wilton, Middlesbrough, Cleveland TS6 8JE (UK)
- 1975-1979 SAËKI, S., Dr.
National Chemical Laboratory for Industry, Ministry of
International Trade and Industry, 1-1 Honmachi, Shibuya-ku,
Tokyo 151 (Japan)
- 1975-1979 SUSCHNY, O., Dr.
International Atomic Energy Agency, Kärntner Ring 11,
POB 590, A-1011 Wien (Austria)

National Representatives

- Czecho-
slovakia* MATRKA, M., Dr.
1974-1977 Research Institute for Organic Syntheses,
CS-532 18 Pardubice-Rybitví
- India* MUKHERJEE, J. N., Dr.
1961-1977 10 Puran Chand Nahar Avenue, Calcutta-13
- Italy* MILONE, M., Prof.
1953-1977 Chemical Institute, University of Torino,
Corso Massimo d'Azeglio 48, Torino
- Japan* MASHIKO, Y., Dr.
1975-1977 National Chemical Laboratory for Industry, Ministry of
International Trade and Industry, 1-1 Honmachi, Shibuya-ku,
Tokyo 151

SUBCOMMITTEE ON CALIBRATION AND TEST MATERIALS

Chairman

KIENITZ, H., Prof.

BASF Aktiengesellschaft, Forschung WOH/B1, D-6700
Ludwigshafen/Rhein (Federal Republic of Germany)
(TEL: 0621-603411. TELEX: 464657)

Members

AMBROSE, D., Dr.

Division of Chemical Standards, National Physical Laboratory,
Department of Industry, Teddington TW11 0LW, Middlesex (UK)

BRUNNER, E., Dr.

BASF Aktiengesellschaft, Ammoniaklaboratorium WAA/M325,
D-6700 Ludwigshafen/Rhein (Federal Republic of Germany)

CALI, J. P., Mr.

National Bureau of Standards, US Department of Commerce,
Washington, DC 20234 (USA)

FEUERBERG, H., Prof.

Bundesanstalt für Materialprüfung, Unter den Eichen 87,
D-1000 Berlin 45 (Federal Republic of Germany)

GREEN, J. H. S., Dr.

Division of Chemical Standards, National Physical Laboratory,
Department of Industry, Teddington TW11 0LW, Middlesex (UK)

HERINGTON, E. F. G., Dr.

29 Seymour Road, East Molesey, Surrey KT8 0PB (UK)

JUHÁSZ, E., Dr.

National Office of Measurements, Németsölgyi Út 37, H-1124
Budapest XII (Hungary)

MILAZZO, G., Prof.

Laboratorio di Chimica, Istituto Superiore di Sanità,
Viale Regina Elena 299, I-00161 Roma (Italy)

NEWTON, A., Mr.

Petrochemicals Division, Imperial Chemical Industries Ltd.,
POB 190, Wilton, Middlesbrough, Cleveland TS6 8JE (UK)

PLEBANSKI, T., Prof.

Division of Physicochemical Metrology, Polish Committee for
Standardization and Measures, Ul. Elektoralna 2, PL 00-139
Warszawa (Poland)

ZIEBLAND, H., Dr.

Process Research Branch, Explosives Research and Development
Establishment, Ministry of Defence (Procurement Executive),
Powdermill Lane, Waltham Abbey, Essex EN9 1BP (UK)

*(Established 1955)***Titular Members***Chairman*

- 1973-1977 BECKER, E. D., Dr.
Building 2, Room 120, National Institutes of Health,
US Department of Health, Education, and Welfare,
Bethesda, Maryland 20014 (USA)
(TEL: 301-496-1024)

Secretary

- 1973-1977 ZERBI, G., Prof.
Istituto di Chimica delle Macromolecole, Consiglio Nazionale
delle Ricerche, Via Alfonso Corti 12, I-20133 Milano (Italy)
(TEL: 296071)

Members

- 1973-1977 BEYNON, J. H., Prof.
Department of Chemistry, University College of Wales,
Singleton Park, Swansea SA2 8PP (UK)
- 1969-1977 HADNI, A., Prof.
Laboratoire Optique IR et du Solide, Université de Nancy I,
Case Officielle No. 140, F-54037 Nancy Cedex (France)
- 1975-1979 KOPTYUG, V. A., Prof.
Institute of Organic Chemistry, Siberian Branch of Academy of
Sciences of USSR, Novosibirsk 80 (USSR)
- 1975-1979 SANDORFY, C., Prof.
Département de Chimie, Université de Montréal, Montreal,
Quebec H3C 3V1 (Canada)
- 1975-1979 SHIMANOUCI, T., Prof.
Department of Chemistry, Faculty of Science, University of
Tokyo, 3-1 Hongo 7-chome, Bunkyo-ku, Tokyo 113 (Japan)
- 1975-1979 TURNER, D. W., Dr.
Physical Chemistry Laboratory, University of Oxford,
South Parks Road, Oxford OX1 3QZ (UK)

Associate Members

- 1975-1979 DIEHL, P., Prof.
Institut für Physik der Universität Basel, Klingelbergstrasse 82,
CH-4056 Basel (Switzerland)
- 1975-1979 DORR, F., Prof.
Institut für Physikalische Chemie und Theoretische Chemie der
Technischen Universität München, Arcisstrasse 21, D-8000
München 2 (Federal Republic of Germany)
- 1970-1977 HERZBERG, G., Dr.
Division of Physics, National Research Council of Canada,
Ottawa, Ontario K1A 0R6 (Canada)

- 1971-1977 JEŻOWSKA-TRZEBIATOWSKA, B., Prof.
Instytut Chemii, Uniwersytet Wrocławski, Ul. Joliot-Curie 14,
PL 50-383 Wrocław (Poland)
- 1973-1977 MORINO, Y., Prof.
Sagami Chemical Research Center, 4-1, 4-chome, Nishionuma,
Sagamihara-shi, Kanagawa 229 (Japan)
- 1971-1977 RAO, C. N. R., Prof.
Department of Chemistry, Indian Institute of Technology,
Kanpur 208016, Uttar Pradesh (India)
- 1967-1977 THOMPSON, Prof. Sir HAROLD
St. John's College, Oxford OX1 3JP (UK)
- 1975-1979 WILLIS, H. A., Dr.
Plastics Division, Imperial Chemical Industries Ltd., POB 6,
Bessemer Road, Welwyn Garden City, Hertfordshire AL7
1HD (UK)

SUBCOMMITTEE ON INFRARED AND RAMAN SPECTROSCOPY

Chairman

DURIG, J. R., Prof.

Department of Chemistry, University of South Carolina,
Columbia, South Carolina 29208 (USA)

(TEL: 803-777-6612)

Members

BRODERSEN, S., Prof.

Department of Chemical Physics, University of Aarhus,
DK-8000 Aarhus C (Denmark)

BULANIN, M. O., Prof.

Institute of Physics, Leningrad State University,
199164 Leningrad (USSR)

COLE, A. R. H., Prof.

School of Chemistry, University of Western Australia,
Nedlands, Western Australia (Australia 6009)

DELHAYE, M., Prof.

Laboratoire de Chimie Physique du Centre National de la
Recherche Scientifique, 2-8 Rue Henri Dunant, F-94320 Thiais
(France)

SCHUTTE, C. J. H., Prof.

Department of Chemistry, University of South Africa,
POB 392, Pretoria 0001 (Republic of South Africa)

SMITH, A. L., Dr.

Spectroscopy Laboratory, Dow Corning Corp.,
POB 1592, Midland, Michigan 48640 (USA)

SUBCOMMITTEE ON STORAGE AND RETRIEVAL OF SPECTROSCOPIC DATA

Chairman

SHIMANOUCI, T., Prof.

Department of Chemistry, Faculty of Science, University of Tokyo,
3-1 Hongo 7-chome, Bunkyo-ku, Tokyo 113 (Japan)

Members

ELYASHEVICH, M. A., Prof.

Faculty of Physics, Byelorussian State University, Minsk (USSR)

FREI, K., Dr.

Research Laboratories, Sandoz AG,
CH-4002 Basel (Switzerland)

JONES, R. N., Dr.

Division of Chemistry, National Research Council of Canada,
Ottawa, Ontario K1A 0R6 (Canada)

LIDE, Jr., D. R., Dr.

Office of Standard Reference Data, National Bureau of Standards,
US Department of Commerce, Washington, DC 20234 (USA)

MACDONALD, R. S., Dr.

Materials Characterizations Operation, General Electric Corporate
Research and Development, Schenectady, New York 12301 (USA)

SUBCOMMITTEE ON MASS SPECTROSCOPY

Chairman

BEYNON, J. H., Prof.
Department of Chemistry, University College of Wales,
Singleton Park, Swansea SA2 8PP (UK)
(TEL: 0792-25678)

Members

BECKEY, H. D., Prof.
Institut für Physikalische Chemie der Rheinischen Friedrich-
Wilhelms-Universität Bonn, Wegelerstrasse 12, D-5300 Bonn
(Federal Republic of Germany)

BIEMANN, K., Prof.
Department of Chemistry, Massachusetts Institute of Technology,
Cambridge, Massachusetts 02139 (USA)

LOSSING, F. P., Dr.
Division of Chemistry, National Research Council of Canada,
Ottawa, Ontario K1A 0R6 (Canada)

MARSEL, J., Prof.
Institut za Nuklearne Nauke Jožef Stefan,
Jamova 31, Ljubljana YU-61001 (Yugoslavia)

ROTH, E., Dr.
Commissariat à l'Énergie Atomique, Centre d'Études Nucléaires
de Saclay, BP 2, F-91190 Gif-sur-Yvette (France)

TAL'ROSE, V. I., Prof.
Institute of Chemical Physics, Academy of Sciences of USSR,
Vorobyevskoye Chaussée 2-b, 117334 Moscow (USSR)

TATEMATSU, A., Prof.
Faculty of Pharmacy, Meijo University
Showa-ku, Nagoya 468 (Japan)

I.6 COMMISSION ON COLLOID AND SURFACE CHEMISTRY

(Established 1961)

Titular Members

Chairman

- 1969-1977 MYSELS, K. J., Dr.
General Atomic Co., POB 81608, San Diego, California
92138 (USA)
(TEL: 714-453-1000)

Vice-Chairman

- 1969-1977 HAUL, R., Prof.
Institut für Physikalische Chemie und Elektrochemie der
Technischen Universität Hannover, Callinstrasse 46, D-3000
Hannover (Federal Republic of Germany)
(TEL: 511-7621)

Secretary

- 1975-1979 LYKLEMA, J., Prof.
Laboratory for Physical and Colloid Chemistry, State
Agricultural University De Dreijen 6, Wageningen (Netherlands)
(TEL: 08370-82279)

Members

- 1969-1977 BURWELL, Jr., R. L., Prof.
Department of Chemistry, Northwestern University,
Evanston, Illinois 60201 (USA)
- 1975-1979 HANSEN, R. G., Prof.
Ames Laboratory, US Energy Research and Development,
Administration, Iowa State University Ames, Iowa 50010 (USA)
- 1969-1977 KAZANSKY, V. B., Dr.
N D Zelinsky Institute of Organic Chemistry, Academy of
Sciences of USSR, Leninskii Prospect 47, 117334 Moscow (USSR)
- 1971-1979 KEMBALL, C., Prof.
Department of Chemistry, University of Edinburgh,
West Mains Road, Edinburgh EH9 3JJ (UK)
- 1975-1979 ROBERTS, M. W., Prof.
School of Chemistry, University of Bradford, Bradford, West
Yorkshire BD7 1DP (UK)

Associate Members

- 1969-1977 BARRER, R. M., Prof.
Department of Chemistry, Imperial College of Science and
Technology, South Kensington, London SW7 2AY (UK)
- 1975-1979 ERTL, G., Prof.
Institut für Physikalische Chemie der Universität München,
Sophienstrasse 11, D-8000 München (Federal Republic of
Germany)

- 1975-1979 **HABER, J., Prof.**
Zakład Katalizy i Fizykochemii Powierzchni, Polska Akademia
Nauk, Ul. Krupnicza 41, PL 30-060 Krakow (Poland)
- 1975-1979 **MUKERJEE, P., Prof.**
School of Pharmacy, University of Wisconsin,
Madison, Wisconsin 53706 (USA)
- 1975-1979 **VAN OLPHEN, H., Prof.**
Division of Chemistry and Chemical Technology,
National Research Council, National Academy of Sciences,
2101 Constitution Avenue, Washington, DC 20418 (USA)
- 1975-1979 **TERMINASSIAN-SARAGA, L., Dr.**
Laboratory for Physical Chemistry of Surfaces and Membranes,
Centre National de la Recherche Scientifique, 2-8 Rue Henri
Dunant, F-94320 Thiais (France)
- 1975-1979 **TRETIKOV, I. I., Dr.**
Institute of Chemical Physics, Academy of Sciences of USSR,
Vorobyevskoye Chaussée 2-b, 117334 Moscow (USSR)
- 1975-1979 **WOLFRAM, E., Prof.**
Department of Colloid Science, Loránd Eötvös University,
Puskin Utca 11-13, H-1088 Budapest (Hungary)

National Representatives

- German* **SCHIRMER, W., Prof.**
Democratic Zentralinstitut für Physikalische Chemie der Akademie der
Republic Wissenschaften der DDR, Rudower Chaussee 5, 1199 Berlin
1975-1977
- Japan* **MORIKAWA, K., Dr.**
1972-1977 Japan Gasoline Co. Ltd., New Ohtemachi Building, Chiyoda-ku,
Tokyo 100
- United* **EVERETT, D. H., Prof.**
Kingdom Department of Physical Chemistry, School of Chemistry,
1975-1977 University of Bristol, Cantock's Close, Bristol BS8 1TS

II INORGANIC CHEMISTRY DIVISION

(Established 1949)

DIVISION COMMITTEE

President

- 1969-1977 MALATESTA, L., Prof.
Istituto di Chimica Generale dell'Università di Milano,
Via G Venezian 21, I-20133 Milano (Italy)
(TEL: 230841)

Vice-President

- 1975-1979 GREENWOOD, N. N., Prof.
Department of Inorganic and Structural Chemistry, University
of Leeds, Leeds LS2 9JT (UK)
(TEL: 0532-31751)

Past-President

- 1959-1977 GUTMANN, V., Prof.
Institut für Anorganische Chemie der Technischen Hochschule
Wien, Getreidemarkt 9, A-1060 Wien (Austria)
(TEL: 571656)

Secretary

- 1971-1977 VLČEK, A. A., Prof.
Ústav Fyzikální Chemie a Elektrochemie J Heyrovského,
Československá Akademie Věd, Vlašská 9, CS-118 40 Praha 1-
Malá Strana (Czechoslovakia)
(TEL: 534150)

Members

- 1975-1979 ALCOCK, C. B., Prof.
Department of Metallurgy and Materials Science, University of
Toronto, Toronto, Ontario M5S 1A1 (Canada)
- 1973-1977 BAGNALL, K. W., Prof.
Department of Chemistry, University of Manchester,
Manchester M13 9PL (UK)
- 1973-1977 FERNELIUS, W. C., Prof.
Department of Chemistry, Kent State University,
Kent, Ohio 44242 (USA)
- 1973-1977 FLUCK, E., Prof.
Institut für Anorganische Chemie der Universität Stuttgart,
Pfaffenwaldring 55, D-7000 Stuttgart 80 (Federal Republic of
Germany)
- 1975-1979 GALLAIS, F., Prof.
Laboratoire de Chimie de Coordination du Centre National de
la Recherche Scientifique, Université de Toulouse,
F-31030 Toulouse (France)
- 1975-1979 YATZIMIRSKII, K. B., Prof.
L V Pisarzhevskii Institute of Physical Chemistry, Academy of
Sciences of Ukrainian SSR, Prospect Nauki 97, Kiev 28 (USSR)

II.1 COMMISSION ON ATOMIC WEIGHTS

(Established 1930)

Titular Members

Chairman

- 1969-1977 ROTH, E., Prof.
Commissariat à l'Énergie Atomique, Centre d'Études
Nucléaires de Saclay, BP 2, F-91190 Gif-sur-Yvette (France)
(TEL: 941-8000)

Secretary

- 1973-1977 HOLDEN, N. E., Dr.
National Neutron Cross Section Center, Brookhaven National
Laboratory, Upton, New York 11973 (USA)
(TEL: 516-345-2901)

Members

- 1975-1979 BARNES, I. L., Dr.
National Bureau of Standards, US Department of Commerce,
Washington, DC 20234 (USA)
- 1973-1977 DE BIÈVRE, P., Dr.
Bureau Central de Mesures Nucléaires, Commission des
Communautés Européennes, B-2400 Geel (Belgium)
- 1971-1979 JOHNSON, W. H., Prof.
School of Physics and Astronomy, University of Minnesota,
Minneapolis, Minnesota 55455 (USA)
- 1975-1979 MARTIN, R. L., Prof.
Research School of Chemistry, Australian National University,
POB 4, Canberra, ACT (Australia 2600)
- 1975-1979 THODE, H. G., Prof.
Nuclear Research Building, Department of Chemistry,
McMaster University, Hamilton, Ontario L8S 4K1 (Canada)
- 1975-1979 WAPSTRA, A. H., Prof.
Instituut voor Kernfysisch Onderzoek, Ooster Ringdijk 18,
POB 4395, NL-1006 Amsterdam O (Netherlands)

Associate Members

- 1973-1977 CAMERON, A. E., Dr.
114 W Malta Road, Oak Ridge, Tennessee 37830 (USA)
- 1975-1979 FUJIWARA, S., Prof.
Department of Chemistry, University of Tokyo,
3-1 Hongo 7-chome, Bunkyo-ku, Tokyo 113 (Japan)
- 1975-1979 GREENWOOD, N. N., Prof.
Department of Inorganic and Structural Chemistry, University of
Leeds, Leeds LS2 9JT (UK)

- 1975-1979 HAGEMANN, R., Dr.
Commissariat à l'Énergie Atomique, Centre d'Études
Nucléaires de Saclay, BP 2, F-91190 Gif-sur-Yvette (France)
- 1975-1979 PEISER, H. S., Mr.
Office of International Relations, National Bureau of Standards,
US Department of Commerce, Washington, DC 20234 (USA)
- 1973-1977 SAITO, N., Prof.
Department of Chemistry, Faculty of Science, University of
Tokyo, 3-1 Hongo 7-chome, Bunkyo-ku, Tokyo 113 (Japan)

II.2 COMMISSION ON NOMENCLATURE OF INORGANIC CHEMISTRY

(Established 1921)

Titular Members

Chairman

- 1975-1979 CHATT, J., Prof.
Agricultural Research Council Unit of Nitrogen Fixation,
University of Sussex, Brighton BN1 9QJ (UK)
(TEL: 0273-66755)

Vice-Chairman

- 1971-1979 JEANNIN, Y., Prof.
Laboratoire de Chimie des Métaux de Transition, Université
Pierre et Marie Curie, 4 Place Jussieu, F-75230 Paris Cedex 05
(France)

Secretary

- 1973-1977 MINGOS, D. M. P., Dr.
Department of Chemistry, Queen Mary College,
Mile End Road, London E1 4NS (UK)
(TEL: 01-980-4811)

Members

- 1971-1979 BERTELLO, L. F., Prof.
Perú 420, Accassuso, Buenos Aires (Argentina)
- 1971-1979 BUSCHBECK, K. CH., Dr.
Gmelin-Institut, Carl-Bosch-Haus, Varrentrappstrasse 40-42,
D-6000 Frankfurt/Main 90 (Federal Republic of Germany)
- 1973-1977 LEIGH, G. J., Dr.
Agricultural Research Council Unit of Nitrogen Fixation,
University of Sussex, Brighton BN1 9QJ (UK)
- 1971-1979 MYASOEDOV, B., Dr.
Radiochemical Laboratory, V I Vernadskii Institute of
Geochemistry and Analytical Chemistry, Academy of Sciences of
USSR, Vorobyevskoye Chaussée 47-a, 117334 Moscow (USSR)
- 1975-1979 POWELL, W. H., Dr.
Chemical Abstracts Service, Ohio State University,
POB 1378, Columbus, Ohio 43210 (USA)

Associate Members

- 1975-1979 ADAMS, R. M., Prof.
Geneva College, Beaver Falls, Pennsylvania 15010 (USA)
- 1969-1977 ERDEY-GRÚZ, T., Prof.
Eötvös Loránd Tudományegyetem Fizikai-Kémiai és Radiológiai
Tanszéke, Puskin Utca 11-13, H-1088 Budapest (Hungary)

- 1975-1979 FERNELIUS, W. C., Prof.
Department of Chemistry, Kent State University, Kent, Ohio
44242 (USA)
- 1973-1977 JENSEN, K. A., Prof.
Kemisk Laboratorium II, H C Ørsted Institutet,
Universitetsparken 5, DK-2100 København Ø (Denmark)
- 1973-1977 RIESS, J., Prof.
Laboratoire de Chimie Minérale et Structurale, Faculté des
Sciences, Université de Nice, Parc Valrose, F-06 Nice (France)
- 1971-1979 SCHÄFFER, C., Dr.
Kemisk Laboratorium II, H C Ørsted Institutet,
Universitetsparken 5, DK-2100 København Ø (Denmark)
- 1969-1977 VLČEK, A. A., Prof.
Ústav Fyzikální Chemie a Elektrochemie J Heyrovského,
Československá Akademie Věd, Vlašská 9, CS-118 40 Praha 1
-Malá Strana (Czechoslovakia)
- 1969-1977 YAMASAKI, K., Prof.
Department of Chemistry, Faculty of Science, Nagoya University,
Chikusa-ku, Nagoya 464 (Japan)

National Representatives

- Czechoslovakia* KLIKORKA, J., Prof.
1974-1977 Department of General and Inorganic Chemistry, University of
Chemical Technology, Leninovo Náměstí 565, CS-532 10 Pardubice
- Federal Republic of Germany* FLUCK, E., Prof.
1975-1977 Institut für Anorganische Chemie der Universität Stuttgart,
Pfaffenwaldring 55, D-7000 Stuttgart 80
- Japan* SAITO, K., Prof.
1975-1977 Department of Chemistry, Faculty of Science, Tohoku University,
Aza Aoba, Aramaki, Sendai 980
- United States of America* COYLE, T. D., Dr.
1974-1977 Inorganic Chemistry Section, National Bureau of Standards,
US Department of Commerce, Washington, DC 20234

II.3 COMMISSION ON HIGH TEMPERATURES AND REFRACTORY MATERIALS

(Established 1951)

Titular Members

Chairman

- 1969-1977 ALCOCK, C. B., Prof.
Department of Metallurgy and Materials Science, University of
Toronto, Toronto, Ontario M5S 1A1 (Canada)
(TEL: 416-928-3013)

Secretary

- 1969-1977 RIECK, G. D., Prof.
Laboratorium voor Fysische Chemie, Technische Hogeschool,
Eindhoven, POB 513, Eindhoven (Netherlands)
(TEL: 040-473054)

Members

- 1969-1977 FITZER, E., Prof.
Institut für Chemische Technik der Universität Karlsruhe,
Kaiserstrasse 12, D-7500 Karlsruhe 1 (Federal Republic of
Germany)
- 1973-1977 FOEX, M., Prof.
Laboratoire des Ultra-Réfractaires du Centre National de la
Recherche Scientifique, BP 5, Odeillo, F-66120 Font Romeu
(France)
- 1973-1977 HLAVÁČ, J., Dr.
Katedra Technologie Silikátů, Vysoké Školy Chemicko-
Technologické v Praze, Suchbátarova 5, CS-166 28 Praha
6-Dejvice (Czechoslovakia)
- 1973-1977 KUBASCHEWSKI, O., Prof.
Institut für Theoretische Hüttenkunde, Rheinisch-Westfälische
Technische Hochschule Aachen, Birkenweg 16, D-5100 Aachen
(Federal Republic of Germany)
- 1973-1977 DE MARIA, G., Prof.
Istituto di Chimica-Fisica ed Elettrochimica, Università di Roma,
Città Universitaria, Roma (Italy)
- 1973-1977 STEELE, B. C. H., Dr.
Department of Metallurgy and Materials Science, Royal School
of Mines, Imperial College of Science and Technology,
South Kensington, London SW7 2BP (UK)

Associate Members

- 1973-1977 AMATO, I., Prof.
Servizio Materiali Inorganici e Processi, Laboratori Centrali,
Fiat SpA, Strada Torino 50, I-10043 Orbassano (Italy)

- 1965-1977 CABANNES, F., Prof.
Centres de Recherches sur Physique des Hautes Températures
du Centre National de la Recherche Scientifique, F-45045 Orleans,
La Source (France)
- 1973-1977 GILLES, P. W., Prof.
Department of Chemistry, University of Kansas, Lawrence,
Kansas 66044 (USA)
- 1973-1977 HORTON, W. S., Dr.
Inorganic Materials Division, National Bureau of Standards,
US Department of Commerce, Washington, DC 20234 (USA)
- 1969-1977 MII, T., Prof.
Department of Mechanical Engineering, Nagoya University,
Furo-cho, Chikusa-ku, Nagoya 464 (Japan)
- 1969-1977 MOTZFELDT, K., Prof.
Institutt for Silikat- og Høytemperaturkjemi, Universitet i
Trondheim-Norges Tekniske Høgskole, N-7034 Trondheim-NTH
(Norway)
- 1969-1977 NOWOTNY, H., Prof.
Institut für Physikalische Chemie der Universität Wien,
Währingerstrasse 42, A-1090 Wien IX (Austria)
- 1973-1977 OHSE, R. W., Dr.
Europäisches Institut für Transurane, Kommission der
Europäischen Gemeinschaften, Postfach 2266, D-7500 Karlsruhe
(Federal Republic of Germany)

National Representatives

- Arab Republic of Egypt*
1973-1977 HUSSEIN, M. K., Prof.
Academy of Scientific Research and Technology,
101 Kasr El Eini Street, Cairo
- Australia*
1969-1977 McCARTNEY, E. R., Dr.
Department of Ceramic Engineering, University of New South
Wales, POB 1, Kensington, New South Wales 2033
- Belgium*
1969-1977 DROWART, J., Prof.
Laboratorium voor Fysische Chemie, Vrije Universiteit Brussel,
Pleinlaan 2, B-1050 Brussels
- France*
1974-1977 COLLONGUES, R., Prof.
Chimie Minérale Appliquée, École Nationale Supérieure de
Chimie, Université de Paris VI, 11 Rue Pierre et Marie Curie,
F-75231 Paris Cedex 05
- India*
1970-1977 ATMA RAM, Dr.
Indian National Science Academy, Bahadur Shah Zafar Marg,
New Delhi-110001
- Israel*
1975-1977 HAMMER, R., Dr.
Israel Ceramic and Silicate Institute, Technion-Israel Institute
of Technology, Haifa

- Italy* SERSALE, R., Prof.
1973-1977 Istituto di Chimica Applicata, Università di Napoli,
 Piazzale Tecchio, I-80125 Napoli
- Poland* MROWEC, S., Prof.
1970-1977 Instytut Chemia Ciała Stałego, Akademia Górniczo-Hutnicza im
 Stanisława Staszica w Krakowie, Aleja Mickiewicza 30, Krakow
- Sweden* MAGNÉLI, A., Prof.
1969-1977 Arrhenius Laboratory, Institute of Inorganic Chemistry,
 University of Stockholm, S-104 05 Stockholm
- Switzerland* BAYER, G. D., Dr.
1975-1977 Institut für Kristallographie und Petrographie der
 Eidgenössischen Technischen Hochschule, Sonneggstrasse 5,
 CH-8006 Zürich
- United States of America* WORRELL, W., Prof.
1976-1977 Department of Chemistry, University of California, Berkeley,
 California 94720
- Yugoslavia* RISTIĆ, M., Prof.
1975-1977 Institute of Technical Sciences, Serbian Academy of Science and
 Art, Knez Mihailova 35, YU-11001 Beograd

III ORGANIC CHEMISTRY DIVISION

(Established 1949)

DIVISION COMMITTEE

President

- 1965-1977 ZOLLINGER, H., Prof.
Technisch-Chemisches Laboratorium der Eidgenössischen
Technischen Hochschule Zürich, Universitätstrasse 6, CH-8006
Zürich (Switzerland)
(TEL: 01-326211)

Past-President

- 1962-1977 KJAER, A., Prof.
Organisk-Kemisk Laboratorium, Danmarks Tekniske Højskole,
Bygning 201, DK-2800 Lyngby (Denmark)
(TEL: 01-882566)

Vice-President

- 1973-1977 YATES, P., Prof.
Department of Chemistry, University of Toronto, Toronto,
Ontario M5S 1A1 (Canada)
(TEL: 416-978-3576)

Secretary

- 1973-1977 ITÔ, S., Prof.
Department of Chemistry, Faculty of Science, Tohoku University,
Aza Aoba, Aramaki, Sendai 980 (Japan)
(TEL: 0222-22-1800)

Members

- 1973-1977 BOEKELHEIDE, V. C., Prof.
Department of Chemistry, University of Oregon, Eugene,
Oregon 97403 (USA)
- 1975-1979 MODENA, G., Prof.
Istituto di Chimica Organica, Università di Padova,
Padova (Italy)
- 1975-1979 MUSSO, H., Prof.
Institut für Organische Chemie der Universität Karlsruhe,
D-7500 Karlsruhe (Federal Republic of Germany)
- 1975-1979 RAPHAEL, R. A., Prof.
University Chemical Laboratory, Lensfield Road, Cambridge
CB2 1EW (UK)
- 1973-1977 TOMKO, J., Prof.
Pharmaceutical Faculty, J A Comenius University,
Odbojárov 12, CS-800 00 Bratislava (Czechoslovakia)

Coopted Members

BROUWER, D. M., Dr.
Koniklijke/Shell-Laboratorium, Shell Research BV,
POB 3003, Amsterdam (Netherlands)

HEUSLER, K., Dr.
CIBA-GEIGY AG, CH-4002 Basel (Switzerland)

MATHIEU, J., Prof.
Centre de Recherches Roussel Uclaf SA,
102 Route de Noisy, F-93230 Romainville (France)

SUKH DEV, Dr.
Malti-Chemical Research Center,
Nandesari, Baroda (India)

TANIDA, H., Dr.
Shionogi Research Laboratory, Shionogi & Co. Ltd.,
Fukushima-ku, Osaka 553 (Japan)

III.1 COMMISSION ON NOMENCLATURE OF ORGANIC CHEMISTRY

(Established 1921)

Titular Members

Chairman

- 1953-1977 LOZAC'H, N., Prof.
École Nationale Supérieure de Chimie, Université de Caen,
5 Avenue d'Edimbourg, F-14032 Caen (France)
(TEL: 31-815714)

Vice-Chairman

- 1967-1977 RIGAUDY, J., Prof.
Laboratoire de Recherches Organiques, École Supérieure de
Physique et de Chimie Industrielle, Université de Paris VI,
10 Rue Vauquelin, F-75231 Paris Cedex 05 (France)
(TEL: 707-8836)

Secretary

- 1968-1977 KLESNEY, S. P., Mr.
Central Report Index, 566 Building, Dow Chemical Co.,
Midland, Michigan 48640 (USA)
(TEL: 517-636-3754)

Members

- 1971-1979 BLÁHA, K., Dr.
Institute of Organic Chemistry and Biochemistry, Československá
Akademie Věd, Flemingovo Náměstí 2, CS-166 10 Praha 6-
Dejvice (Czechoslovakia)
- 1965-1977 CROSS, L. C., Dr.
Chemical Society, Burlington House, Piccadilly, London
W1V 0BN (UK)
- 1973-1977 GRÜNEWALD, H., Dr.
Gesellschaft Deutscher Chemiker, Boschstrasse 12, D-6940
Weinheim (Federal Republic of Germany)
- 1971-1979 KLYNE, W., Prof.
Department of Chemistry, Westfield College,
Hampstead, London NW3 7ST (UK)
- 1965-1977 LOENING, K. L., Dr.
Chemical Abstracts Service, Ohio State University,
POB 1378, Columbus, Ohio 43210 (USA)

Associate Members

- 1971-1977 **HIRAYAMA, K., Dr.**
Research Laboratory, Fuji Photo Film Co. Ltd., Minamiashigara
(near Odawara), Kanagawa-ken 250-01 (Japan)
- 1975-1979 **POWELL, W. H., Dr.**
Chemical Abstracts Service, Ohio State University,
POB 1378, Columbus, Ohio 43210 (USA)
- 1972-1977 **VÖGTLE, F., Prof.**
Organisch-Chemisches Institut der Universität Bonn, Max-
Planck-Strasse, D-5300 Bonn (Federal Republic of Germany).
- 1975-1979 **ZIEGLER, H. J., Dr.**
F Hoffman-La Roche & Co. AG, Grenzacherstrasse 124, CH-4002
Basel (Switzerland)

III.2 COMMISSION ON PHYSICAL ORGANIC CHEMISTRY

(Established 1973)

Titular Members

Chairman

- 1973-1977 ZOLLINGER, H., Prof.
Technisch-Chemisches Laboratorium der Eidgenössischen
Technischen Hochschule Zürich, Universitätstrasse 6, CH-8006
Zürich (Switzerland)
(TEL: 01-326211)

Secretary

- 1973-1977 PENTON, J. R., Dr.
Technisch-Chemisches Laboratorium der Eidgenössischen
Technischen Hochschule Zürich, Universitätstrasse 6, CH-8006
Zürich (Switzerland)
(TEL: 01-326211)

Members

- 1973-1977 BUNNETT, J. F., Prof.
Division of Natural Sciences-II, University of California,
Santa Cruz, California 95064 (USA)
- 1973-1977 GOLD, V., Prof.
Department of Chemistry, King's College, Strand, London
WC2R 2LS (UK)
- 1973-1977 RÜCHARDT, CH., Prof.
Chemisches Laboratorium der Universität Freiburg i. Br.,
Albertstrasse 21, D-7800 Freiburg i. Br. (Federal Republic of
Germany)
- 1973-1977 STREITWIESER, Jr., A. Prof.
Department of Chemistry, University of California,
Berkeley, California 94720 (USA)
- 1973-1977 TOULLEC, J., Dr.
Laboratoire de Chimie Organique Physique, Université de Paris
VII, 1 Rue Guy de la Brosse, F-75005 Paris Cedex 05 (France)

Associate Member

- 1974-1977 COLE, A. R. H., Prof.
School of Chemistry, University of Western Australia, Nedlands,
Western Australia (Australia 6009)

III.3 COMMISSION ON PHOTOCHEMISTRY

(Established in its present form 1975)

Titular Members

Chairman

- 1971-1979 CHAPMAN, O. L., Prof.
Department of Chemistry, University of California,
405 Hilgard Avenue, Los Angeles, California 90024 (USA)
(TEL: 213-825-4883)

Secretary

- 1971-1979 SCHAFFNER, K., Prof.
Département de Chimie Organique, Université de Genève,
30 Quai Ernest Ansermet, CH-1211 Genève 4 (Switzerland)
(TEL: 022-219355)

Members

- 1970-1977 HOYTINK, G. J., Prof.
Department of Chemistry, University of Sheffield,
Sheffield S3 7HF (UK)
- 1973-1977 LAMOLA, A. A., Dr.
Bell Telephone Laboratories Inc., 600 Mountain Avenue, Murray
Hill, New Jersey 07974 (USA)
- 1973-1977 MUKAI, T., Prof.
Department of Chemistry, Faculty of Science, Tohoku University,
Aza Aoba, Aramaki, Sendai 980 (Japan)
- 1969-1977 QUINKERT, G., Prof.
Institut für Organische Chemie der Johann-Wolfgang-Goethe-
Universität, Robert-Mayer-Strasse 7-9, D-6000 Frankfurt/Main
(Federal Republic of Germany)
- 1975-1979 WELLER, A., Prof.
Abteilung Spektroskopie, Karl-Friedrich-Bonhoeffer Institut,
Max-Planck-Institut für Biophysikalische Chemie, Postfach 968,
D-3400 Göttingen-Nikolausberg (Federal Republic of Germany)
- 1975-1979 WRIGHTON, M., Prof.
Department of Chemistry, Massachusetts Institute of Technology,
Cambridge, Massachusetts 02139 (USA)

Associate Member

- 1975-1979 TURNER, D. W., Dr.
Physical Chemistry Laboratory, University of Oxford,
South Parks Road, Oxford OX1 3QZ (UK)

National Representative

- Arab* OSMAN, A. M., Prof.
Republic of University of Assiut, Assiut
Egypt
1973-1977

III.4

COMMISSION ON MEDICINAL CHEMISTRY

(Established in its present form 1975)

Titular Members

Chairman

- 1969-1977 ARIËNS, E. J., Prof.
Farmacologisch Laboratorium, Faculteit der Geneeskunde,
Universiteit van Nijmegen, 'Heyendaal' Geert Grooteplein Noord
21, Nijmegen (Netherlands)
(TEL: 080-558585)

Secretary

- 1969-1977 RACHLIN, A. I., Dr.
Chemical Research Department, Hoffmann-La Roche Inc.,
Nutley, New Jersey 07110 (USA)
(TEL: 201-235-2835)

Members

- 1975-1979 CAVALLA, J. F., Dr.
John Wyeth and Brother Ltd., Huntercombe Lane South, Taplow,
Maidenhead, Berkshire SL6 0PH (UK)
- 1973-1977 HUMBER, L. G., Dr.
Ayerst Laboratories, Division of Ayerst, McKenna & Harrison Ltd.,
POB 6115, Montreal 101, Quebec (Canada)
- 1975-1979 MUTSCHLER, E, Prof.
Pharmakologie für Naturwissenschaftler, Johann-Wolfgang-
Goethe-Universität, Robert-Mayer-Strasse 7, D-6000 Frankfurt/
Main (Federal Republic of Germany)
- 1971-1979 PROTIVA, M., Dr.
Výzkumny Ústav pro Farmacii a Biochemii, Kouřimská 17,
CS-130 00 Praha 3-Vinohrady (Czechoslovakia)
- 1975-1979 SAREL, S., Prof.
School of Pharmacy, Hebrew University of Jerusalem,
POB 12065, Jerusalem (Israel)
- 1973-1977 THUILLIER, J., Dr.
Société de Chimie Thérapeutique, 6-12 Rue Raffet, F-75016
Paris Cedex 16 (France)

Associate Members

- 1975-1979 DAHLBOM, R., Prof.
Institute of Organic Pharmaceutical Chemistry, University of
Uppsala, POB 574, S-751 23 Uppsala (Sweden)
- 1975-1979 HOULIHAN, W., Dr.
Sandoz-Wander Inc., Route 10, East Hanover, New Jersey 07936
(USA)
- 1975-1979 KOBAYASHI, T., Dr.
Mitsubishi Yuka Pharmaceutical Co. Ltd., Mitsubishi Building,
5-2 Marunouchi 2-chome, Chiyoda-ku, Tokyo 100 (Japan)

- 1975-1979 MARINI-BETTOLO, G. B., Prof.
Istituto di Chimica, Facolta di Medicina, Università Cattolica del
Sacro Cuore, Via Pineta Sacchetti 644, I-00168 Roma (Italy)
- 1975-1979 MATHIEU, J., Prof.
Centre de Recherches Roussel Uclaf SA, 102 Route de Noisy,
F-93230 Romainville (France)
- 1975-1979 NAUTA, W. TH., Prof.
Vakgroep Farmacochemie, Subfaculteit der Scheikunde, Vrije
Universiteit, De Boelelaan 1083, NL-1011 Amsterdam (Netherlands)
- 1971-1977 NITYA ANAND, Dr.
Division of Medicinal Chemistry, Central Drug Research Institute,
Chattar Manzil Palace, POB 173, Lucknow, Uttar Pradesh (India)
- 1975-1979 TOLDY, L., Dr.
Institute for Drug Research, Szabadságharcosok Utca 47-49,
H-1045 Budapest (Hungary)

Representative of IUB

HOFFMANN-OSTENHOF, O., Prof.
Institut für Allgemeine Biochemie der Universität Wien,
Währingerstrasse 38, A-1090 (Austria)

COORDINATING COMMITTEE ON EDUCATION

Chairman

NAUTA, W. TH., Prof.

Vakgroep Farmacochemie, Subfaculteit der Scheikunde, Vrije
Universiteit, De Boelelaan 1083, NL-1011 Amsterdam (Netherlands)
(TEL: 482963)

Secretary

CAVALLA, J. F., Dr.

John Wyeth and Brother Ltd., Huntercombe Lane South, Taplow,
Maidenhead, Berkshire SL6 0PH (UK)
(TEL: 0753-28311. TELEX: 847640)

Members

ALBERT, A., Prof.

Department of Pharmacological Sciences, Health Sciences Center,
State University of New York at Stony Brook, Stony Brook,
New York 11790 (USA)

BURGER, A., Prof.

1310 Blue Ridge Road, Charlottesville, Virginia 22903 (USA)

COMBET-FARNOUX, C., Prof.

Faculté des Sciences Pharmaceutiques et Biologiques, Laboratoire
de Chimie Organique, 3 Rue Jean-Baptiste Clement, F-92290
Chatenay-Malabry (France)

MUTSCHLER, E., Prof.

Pharmakologie für Naturwissenschaftler, Johann-Wolfgang-
Goethe-Universität, Robert-Mayer-Strasse 7, D-6000 Frankfurt/
Main (Federal Republic of Germany)

PRATESI, P., Prof.

Istituto Chimico Farmaceutico e Tossicologico, Università di
Milano, Via Pinturicchio 24, Milano (Italy)

COORDINATING COMMITTEE ON LONG RANGE PLANNING

Chairman

CAVALLA, J. F., Dr.

John Wyeth and Brother Ltd., Huntercombe Lane South, Taplow,
Maidenhead, Berkshire SL6 0PH (UK)
(TEL: 0753-28311. TELEX: 847640)

Secretary

MUTSCHLER, E., Prof.

Pharmakologie für Naturwissenschaftler, Johann-Wolfgang-
Goethe-Universität, Robert-Mayer-Strasse 7, D-6000 Frankfurt/
Main (Federal Republic of Germany)
(TEL: 0611-7983800)

Members

ALBERT, A., Prof.

Department of Pharmacological Sciences, Health Sciences Center,
State University of New York at Stony Brook, Stony Brook, New
York 11790 (USA)

ARIËNS, E. J., Prof.

Farmacologisch Laboratorium, Faculteit der Geneeskunde
Universiteit van Nijmegen, 'Heyendaal' Geert Grooteplein Noord
21, Nijmegen (Netherlands)

BURGER, A., Prof.

1310 Blue Ridge Road, Charlottesville, Virginia 22903 (USA)

CAMPAIGNE, E., Prof

Department of Chemistry, Indiana University, Bloomington,
Indiana 47401 (USA)

SAREL, S., Prof.

School of Pharmacy, Hebrew University of Jerusalem,
POB 12065, Jerusalem (Israel)

SENSI, P., Prof.

Research Laboratories, Gruppo Lepetit SpA,
Via Durando 38, I-20158 Milano (Italy)

IV MACROMOLECULAR DIVISION

(Established 1967)

DIVISION COMMITTEE

President

- 1967-1977 OVERBERGER, C. G., Prof.
4080 Administration Building, University of Michigan,
Ann Arbor, Michigan 48109 (USA)
(TEL: 313-764-1185)

Past-President

- 1967-1977 BENOÎT, H., Prof.
Centre de Recherches sur les Macromolécules du Centre National
de la Recherche Scientifique, 6 Rue Boussingault, F-67083
Strasbourg Cedex (France)
(TEL: 88-616857)

Vice-President

- 1971-1977 KABANOV, V. A., Prof.
Department of Macromolecular Chemistry, Lomonosov Moscow
State University, Leninskii Gory, 117234 Moscow (USSR)
(TEL: 139-16-71)

Secretary

- 1971-1977 DE VRIES, A. J., Dr.
Centre de Recherches de la Croix-de-Berny, Rhône-Poulenc SA,
182-184 Avenue Aristide Briand, F-92160 Antony (France)
(TEL: 702-5180)

Members

- 1975-1979 BAMFORD, C. H., Prof.
Donnan Laboratories, Department of Inorganic, Physical, and
Industrial Chemistry, University of Liverpool, Grove Street, POB
147, Liverpool L69 3BX (UK)
- 1975-1979 CORRADINI, P., Prof.
Istituto Chimico, Università di Napoli,
Via Mezzocannone 4, I-80134 Napoli (Italy)
- 1975-1979 NAKAJIMA, A., Prof.
Department of Polymer Chemistry, Kyoto University, Yoshida-
machi, Sakyo-ku, Kyoto 606 (Japan)
- 1975-1979 SCHULZ, R. C., Prof.
Organisch-Chemisches Institut, J. J. Becher-Weg 18-20, D-6500
Mainz (Federal Republic of Germany)
- 1975-1979 TUDÖS, F., Prof.
Central Research Institute for Chemistry, Hungarian Academy of
Sciences, Puskaszeri Út 57-69, H-1025 Budapest (Hungary)
- 1975-1979 WINSLOW, F. H., Dr.
Bell Telephone Laboratories Inc., 600 Mountain Avenue,
Murray Hill, New Jersey 07974 (USA)

Coopted Members

BARRETT, J. W., Dr.

Monsanto Ltd., Monsanto House, 10-18 Victoria Street, London SW1H 0NQ (UK)

FINK-JENSEN, P. H., Mr.

A/S Sadolin og Holmblad, Holmbladsgade 70, DK-2300 København S (Denmark)

HEINZE, D., Dr.

BASF Aktiengesellschaft, D-6700 Ludwigshafen/Rhein (Federal Republic of Germany)

IWAKURA, Y., Prof.

Department of Industrial Chemistry, College of Technology, Seikei University, Kichijoji Kitamachi 3, Musashino-shi, Tokyo 180 (Japan)

KEPES, A., Dr.

CDF Chimie, Tour Aurore, F-92080 Paris-La Defense Cedex 5 (France)

MANDEL, M., Prof.

Gorlaeus Laboratoria der Rijksuniversiteit, Wassenaarseweg, POB 75, Leiden (Netherlands)

SAUNDERS, J. H., Dr.

Monsanto Textiles Co., POB 12830, Pensacola, Florida 32575 (USA)

VAKULA, V. L., Dr.

Technical Department, USSR Ministry of Chemical Industry, Kirov Street, Moscow (USSR)

WICHTERLE, O., Prof.

Institute of Macromolecular Chemistry, Československá Akademie Věd, Petřiny 1888, CS-162 06 Praha 616 (Czechoslovakia)

National Representatives

Australia
1968-1977

SOLOMON, D. H., Dr.

Division of Applied Chemistry, Commonwealth Scientific and Industrial Research Organization, POB 4331, Melbourne, Victoria 3001

Austria
1970-1977

BREITENBACH, J. W., Prof.

Institut für Physikalische Chemie der Universität Wien, Währingerstrasse 42, A-1090 Wien IX

Belgium
1975-1977

TEYSSIÉ, PH., Prof.

Laboratoire de Chimie Macromoléculaire et de Catalyse Organique, Université de Liège au Sart Tilman, B-4000 Liège

Bulgaria
1968-1977

PANAYOTOV, I. M., Prof.

Central Laboratory for Polymers, Bulgarian Academy of Sciences, Sofia 13

- Czechoslovakia* KÁLAL, J., Prof.
1974-1977 Institute of Macromolecular Chemistry, Československá Akademie Věd, Petřiny 1888, CS-162 06 Praha 616
- Denmark* KOPS, J., Prof.
1974-1977 Institutet for Kemiindustri, Danmarks Tekniske Højskole, Bygning 227, DK-2800 Lyngby
- Federal Republic of Germany* ENGEL, F., Dr.
1968-1977 Chemische Werke Hüls AG, D-4370 Marl/Westfahlen
- Finland* LINDBERG, J. J., Prof.
1971-1977 Department of Wood and Polymer Chemistry, University of Helsinki, Malminkatu 20, SF-00100 Helsinki 10
- France* SIGWALT, P., Prof.
1972-1977 Laboratoire de Chimie Macromoléculaire, Université Pierre et Marie Curie, 4 Place Jussieu, F-75230 Paris Cedex 05
- German Democratic Republic* PHILIPP, B., Prof.
1975-1977 Institut für Polymerenchemie der Akademie der Wissenschaften der DDR, Kantstrasse 55, 153 Teltow
- Hungary* HARDY, G., Prof.
1975-1977 Research Institute for the Plastics Industry, Hungária Körút 114, H-1950 Budapest
- Ireland* PEPPER, D. C., Prof.
1975-1977 Chemical Laboratory, Trinity College, University of Dublin, Dublin 2
- Israel* SILBERBERG, A., Prof.
1968-1977 Weizmann Institute of Science, Rehovot
- Italy* FARINA, M., Prof.
1976-1977 Facoltà di Scienze, Università di Milano, Via C Saladini 50, Milano
- Japan* OKAMURA, S., Prof.
1975-1977 Department of Polymer Chemistry, Kyoto University, Yoshida-machi, Sakyo-ku, Kyoto 606
- Norway* UGELSTAD, J., Prof.
1968-1977 Institutt for Industriell Kjemi, Universitet i Trondheim-Norges Tekniske Høgskole, N-7034 Trondheim-NTH
- Poland* TURSKA, E., Prof.
1968-1977 Department of Physical Chemistry of High Polymers, Polytechnic Institute of Lodz, Zwirki 36, Lodz
- Republic of South Africa* NEUSE, E. W., Prof.
1976-1977 Department of Chemistry, University of the Witwatersrand, 1 Jan Smuts Avenue, Johannesburg 2001

- Romania* SIMIONESCU, C. I., Prof.
1969-1977 Academia Republicii Socialiste România,
Strada Universității Nr.16, Iași
- Spain* FONTAN, J., Prof.
1975-1977 Instituto de Plásticos y Caucho,
Juan de la Cierva 3, Madrid-6
- Sweden* RÅNBY, B., Prof.
1969-1977 Department of Polymer Technology, Royal Institute of
Technology, S-100 44 Stockholm 70
- United Kingdom* ALLEN, G., Prof.
1975-1977 Department of Chemical Engineering and Chemical Technology,
Imperial College of Science and Technology, London SW7 2BY
- United States of America* BAILEY, W. J., Prof.
1968-1977 Department of Chemistry, University of Maryland,
College Park, Maryland 20742

Representative of IUPAB

SCHERAGA, H. A., Prof.
Department of Chemistry, Cornell University,
Ithaca, New York 14850 (USA)

Representative of IUPAP

BECKER, G. W., Prof.
Bundesanstalt für Materialprüfung, Unter den Eichen 87, D-1000
Berlin 45 (Dahlem) (Federal Republic of Germany)

IV.1 COMMISSION ON MACROMOLECULAR NOMENCLATURE

(Established 1968)

Titular Members

Chairman

- 1968-1977 LOENING, K., Dr.
Chemical Abstracts Service, Ohio State University,
POB 1378, Columbus, Ohio 43210 (USA)
(TEL: 614-421-6940)

Secretary

- 1968-1977 FOX, R. B., Dr.
Code 6120, US Naval Research Laboratory, Department of the
Navy, Washington, DC 20375 (USA)
(TEL: 202-767-2130)

Members

- 1968-1977 CORRADINI, P., Prof.
Istituto Chimico, Università di Napoli,
Via Mezzocannone 4, I-80134 Napoli (Italy)
- 1975-1979 JENKINS, A. D., Prof.
School of Molecular Sciences, University of Sussex,
Falmer, Brighton BN1 9QJ (UK)
- 1971-1979 PLATÉ, N. A., Prof.
Institute of Petrochemical Synthesis, Academy of Sciences of
USSR, Leninskii Prospect 29, 117912 Moscow (USSR)
- 1971-1979 RING, W., Dr.
Chemische Werke Hüls AG, Organische Abteilung,
Postfach 1180, D-4370 Marl Kreis Recklinghausen (Federal
Republic of Germany)
- 1975-1979 SIGWALT, P., Prof.
Laboratoire de Chimie Macromoléculaire, Université Pierre et
Marie Curie, 4 Place Jussieu, F-75230 Paris Cedex 05 (France)
- 1968-1977 TSURUTA, T., Prof.
Department of Synthetic Chemistry, Faculty of Engineering,
University of Tokyo, 3-1 Hongo 7-chome, Bunkyo-ku, Tokyo
113 (Japan)

Associate Members

- 1974-1977 BIKALES, N. M., Prof.
Ralph G Wright Chemistry Laboratory, Rutgers University,
New Brunswick, New Jersey 08903 (USA)
- 1975-1979 CROSS, L. C., Dr.
Chemical Society, Burlington House, Piccadilly, London W1V
0BN (UK)
- 1975-1979 WILSKI, H., Dr.
Hoechst AG, D-6230 Frankfurt/Main 80 (Federal Republic of
Germany)

IV.2 COMMISSION ON POLYMER CHARACTERIZATION AND PROPERTIES

(Established 1973)

Titular Members

Chairman

- 1975-1979 BARRETT, J. W., Dr.
Monsanto Ltd., Monsanto House, 10-18 Victoria Street, London
SW1H 0NQ (UK)
(TEL: 01-222-5678)

Members

- 1975-1979 CLEGG, P. L., Dr.
Plastics Division, Imperial Chemical Industries Ltd.,
POB 6, Bessemer Road, Welwyn Garden City, Hertfordshire
AL7 1HD (UK)
- 1975-1979 FINK-JENSEN, P. H., Mr.
A/S Sadolin og Holmblad, Holmbladsgade 70, DK-2300
København S (Denmark)
- 1975-1979 WILSKI, H., Dr.
Hoechst AG, D-6230 Frankfurt/Main 80 (Federal Republic of
Germany)

V ANALYTICAL CHEMISTRY DIVISION

(Established 1949)

DIVISION COMMITTEE

President

- 1969-1977 TANAKA, N., Prof.
Department of Chemistry, Faculty of Science, Tohoku University,
Aza Aoba, Aramaki, Sendai 980 (Japan)
(TEL: 0222-22-1800)

Vice-President

- 1971-1977 WEST, T. S., Prof.
Macaulay Institute for Soil Research,
Craigiebuckler, Aberdeen AB9 2QJ (UK)
(TEL: 0224-38611)

Secretary

- 1975-1979 WHITE, J. C., Dr.
Analytical Chemistry Division, Oak Ridge National Laboratory,
POB X, Oak Ridge, Tennessee 37830 (USA)
(TEL: 615-483-8611)

Members

- 1975-1979 DUYCKAERTS, G., Prof.
Chimie Analytique et Radiochimie, Université de Liège au Sart
Tilman, B-4000 Liège (Belgium)
- 1975-1979 FREISER, H., Prof.
Department of Chemistry, University of Arizona,
Tucson, Arizona 85721 (USA)
- 1973-1977 HUME, D. N., Prof.
Department of Chemistry, Massachusetts Institute of Technology,
Cambridge, Massachusetts 02139 (USA)
- 1973-1977 KAISER, H., Prof.
Institut für Spektrochemie und Angewandte Spektroskopie,
Postfach 778, Bunsen-Kirchhoff-Strasse 11, D-4600 Dortmund
(Federal Republic of Germany)
- 1975-1979 PELLERIN, F., Prof.
Hôpital Général Emile Roux, F-95600 Eaubonne (France)
- 1975-1979 PUNGOR, E., Prof.
Általános és Analitikai Kémiai Tanszék, Budapesti Műszaki
Egyetem, Gellért Tér 4, H-1502 Budapest (Hungary)
- 1975-1979 SAVVIN, S. B., Prof.
V I Vernadskii Institute of Geochemistry and Analytical Chemistry,
Academy of Sciences of USSR, Vorobyevskoye Chaussée 47-a,
117334 Moscow (USSR)

V.1 COMMISSION ON ANALYTICAL REACTIONS AND REAGENTS

(Established 1934)

Titular Members

Chairman

- 1968-1977 BELCHER, R., Prof.
Department of Chemistry, University of Birmingham,
POB 363, Birmingham B15 2TT (UK)
(TEL: 021-472-1301)

Secretary

- 1969-1977 HULANICKI, A., Dr.
Instytut Podstawowych, Problemów Chemii, Wydział Chemii,
Uniwersytet Warszawski, Ul. Pasteura 1, PL-02 093 Warszawa
(Poland)
(TEL: 220211)

Members

- 1971-1977 BARTOS, J., Dr.
Centre de Recherches Roussel Uclaf SA,
102 Route de Noisy, F-93230 Romainville (France)
- 1975-1979 INCZEDY, J., Prof.
Analitikai Kémiai Tanszék, Veszprémi Vegyipari Egyetem,
Schönherz Z.u. 12, H-8201 Veszprém (Hungary)
- 1971-1977 KAPEL, M., Dr.
Proctor Department of Food and Leather Science, University of
Leeds, Leeds LS2 9JT (UK)
- 1969-1977 REIDINGER, F. J., Mr.
Film Division, Olin Corp., Pisgah Forest, North Carolina 28768
(USA)
- 1968-1977 SIGGIA, S., Prof.
Department of Chemistry, Commonwealth of Massachusetts,
University of Massachusetts, Amherst, Massachusetts 01002 (USA)
- 1970-1977 WEISZ, H., Prof.
Lehrstuhl für Analytische Chemie, Chemisches Laboratorium der
Universität Freiburg i.Br., Albertstrasse 21, D-7800 Freiburg i.Br.
(Federal Republic of Germany)

Associate Members

- 1975-1979 ACKERMANN, G., Prof.
Sektion Chemie, Abteilung Gleichgewichte, Bergakademie
Freiberg, Leipziger Strasse, 92 Freiberg (German Democratic
Republic)
- 1975-1979 BANKOWSKI, YU. A., Prof.
Institute of Inorganic Chemistry, Latvia Academy of Sciences,
Meistam 10, Riga (USSR)

- 1975-1979 DEN BOEF, G., Prof.
Laboratory of Analytical Chemistry, University of Amsterdam,
Amsterdam (Netherlands)
- 1975-1979 JORDANOV, N., Prof.
Institute of General and Inorganic Chemistry, Bulgarian Academy
of Sciences, Sofia 13 (Bulgaria)
- 1973-1977 LUCENA CONDE, F., Prof.
Isaac Peral 42-3º, Madrid-15 (Spain)
- 1975-1979 PELLERIN, F., Prof.
Hôpital Général Emile Roux, F-95600 Eaubonne (France)
- 1971-1977 PESEZ, M., Dr.
Centre de Recherches Roussel Uclaf SA,
102 Route de Noisy, F-93230 Romainville (France)
- 1973-1977 STEPHEN, W. I., Dr.
Department of Chemistry, University of Birmingham,
POB 363, Birmingham B15 2TT (UK)

National Representatives

- Belgium* DUYCKAERTS, G., Prof.
1975-1977 Chimie Analytique et Radiochimie, Université de Liège au Sart
Tilman, B-4000 Liège
- Union of Soviet Socialist Republics* SAVVIN, S. B., Prof.
1975-1977 V I Vernadskii Institute of Geochemistry and Analytical
Chemistry, Academy of Sciences of USSR, Vorobyevskoye
Chaussée 47-a, 117334 Moscow
- United Kingdom* BISHOP, E., Prof.
1975-1977 Department of Chemistry, University of Exeter, Stocker Road,
Exeter EX4 4QD, Devon

V.2 COMMISSION ON MICROCHEMICAL TECHNIQUES AND TRACE ANALYSIS

(Established in its present form 1967)

Titular Members

Chairman

- 1971-1977 MORRISON, G. H., Prof.
Department of Chemistry, Cornell University, Ithaca, New York
14853 (USA)
(TEL: 607-256-3614)

Secretary

- 1971-1977 PÍNTA, M., Dr.
Laboratoire de Spectrographie, Office de la Recherche
Scientifique et Technique Outre-Mer, 70-74 Route d'Aulnay,
F-93140 Bondy (France)
(TEL: 847-5295)

Members

- 1969-1977 CHENG, K. L., Prof.
Department of Chemistry, University of Missouri, Kansas City,
Missouri 64110 (USA)
- 1971-1977 GOMIŠČEK, S., Prof.
Faculty of Natural Sciences and Technology, University of
Ljubljana, Murnikova 6, YU-61000 Ljubljana (Yugoslavia)
- 1975-1979 GRASSERBAUER, M., Dr.
Institut für Analytische Chemie und Mikrochemie der
Technischen Hochschule Wien, Getreidemarkt 9, A-1060 Wien
(Austria)
- 1973-1977 MIZUIKE, A., Prof.
Faculty of Engineering, Nagoya University, Chikusa-ku,
Nagoya 464 (Japan)
- 1973-1977 TERENT'EVA, E. A., Dr.
Institute of Organoelement Compounds, Academy of Sciences of
USSR, Ul. Vavilova 28, 117312 Moscow (USSR)
- 1975-1979 TÖLG, G., Prof.
Laboratorium für Reinstoffe, Max-Planck-Institut für
Metallforschung, Katharinenstrasse 17, D-7070 Schwäbisch
Gmünd (Federal Republic of Germany)

Associate Members

- 1975-1979 LA FLEUR, P., Dr.
Analytical Chemistry Division, National Bureau of Standards,
US Department of Commerce, Washington, DC 20234 (USA)
- 1973-1977 GEL'MAN, N. E., Dr.
Institute of Organoelement Compounds, Academy of Sciences
of USSR, Ul. Vavilova 28, 117312 Moscow (USSR)

- 1975-1979 JACKWERTH, E., Prof.
Institut für Spektrochemie und Angewandte Spektroskopie,
Postfach 778, Bunsen-Kirchhoff-Strasse 11, D-4600 Dortmund
(Federal Republic of Germany)
- 1975-1979 KOCH, O. G., Dr.
Chemisches Laboratorium, Neunkircher Eisenwerke AG,
Goethestrasse 24, D-6680 Neunkirchen Saar (Federal Republic of
Germany)
- 1971-1977 LÉVY, R., Dr.
Service Central de Microanalyse du Centre National de la
Recherche Scientifique, 2-8 Rue Henri Dunant, F-94320 Thiais
(France)
- 1975-1979 TOWNSHEND, A., Dr.
Department of Chemistry, University of Birmingham,
POB 363, Birmingham B15 2TT (UK)
- 1975-1979 ZOLOTOV, YU. A., Prof.
V I Vernadskii Institute of Geochemistry and Analytical
Chemistry, Academy of Sciences of USSR, Vorobyevskoye
Chaussée 47-a, 117334 Moscow (USSR)

V.3 COMMISSION ON ANALYTICAL NOMENCLATURE

(Established in its present form 1959)

Titular Members

Chairman

- 1969-1977 ZETTLER, H., Dr.
Norddeutsche Affinerie, Postfach 67, Alsterterrasse 2, D-2000
Hamburg 36 (Federal Republic of Germany)
(TEL: 040-7883607. TELEX: 0214081)

Secretary

- 1973-1977 GUILBAULT, G. G., Prof.
Department of Chemistry, University of New Orleans,
Lake Front, New Orleans, Louisiana 70122 (USA)
(TEL: 504-283-3892)

Members

- 1973-1977 FREISER, H., Prof.
Department of Chemistry, University of Arizona,
Tucson, Arizona 85721 (USA)
- 1975-1979 KIRKBRIGHT, G. F., Dr.
Department of Chemistry, Imperial College of Science and
Technology, South Kensington, London SW7 2AY (UK)
- 1969-1977 MENIS, O., Dr.
Analytical Chemistry Division, National Bureau of Standards,
US Department of Commerce, Washington, DC 20234 (USA)
- 1973-1977 RICE, N. M., Dr.
Department of Mining and Mineral Sciences,, University of Leeds,
Leeds LS2 9JT (UK)
- 1971-1977 ROBERTSON, A. J. B., Prof.
Department of Chemistry, King's College, Strand, London
WC2R 2LS (UK)
- 1975-1979 SVEHLA, G., Dr.
Department of Chemistry, Queen's University of Belfast,
Belfast BT9 5AG, Northern Ireland (UK)

Associate Members

- 1975-1979 DYRSSEN, D., Prof.
Department of Analytical Chemistry, University of Göteborg,
S-402 20 Göteborg (Sweden)
- 1973-1977 FISCHER, W., Prof.
Lugostrasse 14, D-7800 Freiburg i.Br. (Federal Republic of
Germany)
- 1975-1979 IRVING, H. M. N. H., Prof.
1 North Grange Mount, Leeds LS6 2BY (UK)

- 1975-1979 PERONE, S. P., Prof.
Department of Chemistry, University of Purdue Lafayette,
Indiana 47907 (USA)
- 1975-1979 ROGERS, L. B., Prof.
Department of Chemistry, University of Georgia, Athens,
Georgia 30602 (USA)
- 1973-1977 TOLG, G., Prof.
Laboratorium für Reinstoffe, Max-Planck-Institut für
Metallforschung, Katharinenstrasse 17, D-7070 Schwäbisch
Gmünd (Federal Republic of Germany)
- 1975-1979 TOWNSHEND, A., Dr.
Department of Chemistry, University of Birmingham,
POB 363, Birmingham B15 2TT (UK)
- 1973-1977 WEST, T. S., Prof.
Macaulay Institute for Soil Research,
Craigiebuckler, Aberdeen AB9 2QJ (UK)

National Representative

- Arab* TAWFIK, H. A., Prof.
Republic of Faculty of Pharmacy, Alexandria University,
Egypt Alexandria
1973-1977

V.4 COMMISSION ON SPECTROCHEMICAL AND OTHER OPTICAL PROCEDURES FOR ANALYSIS

(Established in its present form 1959)

Titular Members

Chairman

- 1967-1977 BIRKS, L. S., Mr.
Code 6480, X-Ray Optics Branch, Naval Research Laboratory,
US Department of the Navy, Washington, DC 20375 (USA)
(TEL: 202-767-2154)

Secretary

- 1971-1977 WINEFORDNER, J. D., Prof.
Department of Chemistry, University of Florida, Gainesville,
Florida 32611 (USA)
(TEL: 904-392-0556)

Members

- 1975-1979 LAQUA, K., Dr.
Institut für Spektrochemie und Angewandte Spektroskopie,
Postfach 778, Bunsen-Kirchhoff-Strasse 11, D-4600 Dortmund
(Federal Republic of Germany)
- 1975-1979 MELHUISE, W. H., Dr.
Institute of Nuclear Sciences, Department of Scientific and
Industrial Research, Private Bag, Lower Hutt (New Zealand)
- 1975-1979 MÜLLER, R., Dr.
CIBA-GEIGY AG, CH-4002 Basel (Switzerland)
- 1967-1977 PLŠKO, E., Dr.
Geologický Ústav Univerzity Komenského, Zadunajská 15,
CS-811 00 Bratislava (Czechoslovakia)
- 1971-1979 ROBIN, J. P., Prof.
Bâtiment 401, Institut National des Sciences Appliquées de Lyon,
20 Avenue Albert Einstein, F-69621 Villeurbanne (France)
- 1975-1979 STRASHEIM, A., Dr.
National Physical Research Laboratory, Council for Scientific
and Industrial Research, POB 395, Pretoria 0001 (Republic of
South Africa)

Associate Members

- 1975-1979 ALKEMADE, C. TH. J., Prof.
Fysisch Laboratorium, Rijksuniversiteit Utrecht,
Sorbonnelaan 4, NL-2506 Utrecht (Netherlands)
- 1975-1979 BELYAEV, YU. I., Dr.
V I Vernadskii Institute of Geochemistry and Analytical Chemistry,
Academy of Sciences of USSR, Vorobyevskoye Chaussée 47-a,
117334 Moscow (USSR)

- 1975-1979 FASSEL, V. A., Prof.
Ames Laboratory, US Energy Research and Development
Administration, Iowa State University, Ames, Iowa 50010 (USA)
- 1972-1977 JENKINS, R., Mr.
Philips Electronic Instruments Inc., 750 South Fulton Avenue,
Mount Vernon, New York 10550 (USA)
- 1971-1977 KAISER, H., Prof.
Institut für Spektrochemie und Angewandte Spektroskopie,
Postfach 778, Bunsen-Kirchhoff-Strasse 11, D-4600 Dortmund
(Federal Republic of Germany)
- 1967-1977 RUBEŠKA, I., Dr.
Ústředni Ústav Geologický, Kostelní 26, CS-170 00 Praha 7
(Czechoslovakia)
- 1975-1979 ZANDER, M., Dr.
Rutgerswerke AG, Kekule Strube 30, D-4620 Castrop-Rauxel
(Federal Republic of Germany)

V.5 COMMISSION ON ELECTROANALYTICAL CHEMISTRY

(Established in its present form 1963)

Titular Members

Chairman

- 1971-1979 BATES, R. G., Prof.
Department of Chemistry, University of Florida, Gainesville,
Florida 32611 (USA)
(TEL: 904-392-0561)

Secretary

- 1971-1979 COETZEE, J. F., Prof.
Department of Chemistry, University of Pittsburgh, Pittsburgh,
Pennsylvania 15260 (USA)
(TEL: 412-621-3500)

Members

- 1969-1977 BISHOP, E., Prof.
Department of Chemistry, University of Exeter, Stocker Road,
Exeter EX4 4QD, Devon (UK)
- 1971-1979 FUJINAGA, T., Prof.
Department of Chemistry, Faculty of Science, Kyoto University,
Sakyo-ku, Kyoto 606 (Japan)
- 1969-1977 GALUS, Z., Prof.
Wydział Chemii, Uniwersytet Warszawski, Ul. Pasteura 1,
PL 02-093 Warszawa (Poland)
- 1975-1979 JORDAN, J., Prof.
152 Davey Laboratory, Pennsylvania State University, University
Park, Pennsylvania 16802 (USA)
- 1971-1979 NÜRNBERG, H. W., Prof.
Institut für Angewandte Physikalische Chemie der
Kernforschungsanlage Jülich GmbH, Postfach 365, D-5170
Jülich 1 (Federal Republic of Germany)
- 1973-1977 ZUMAN, P., Prof.
Department of Chemistry, Clarkson College of Technology,
Potsdam, New York 13676 (USA)

Associate Members

- 1973-1977 BRANICA, M., Prof.
Ruder Bošković Institute, POB 1016, Zagreb (Yugoslavia)
- 1975-1979 COVINGTON, A. K., Dr.
School of Chemistry, University of Newcastle upon Tyne,
Newcastle upon Tyne NE1 7RU (UK)
- 1975-1979 GIERST, L., Prof.
Electrochimie A, Faculté des Sciences, Université Libre de
Bruxelles, 50 Avenue F D Roosevelt, B-1050 Bruxelles (Belgium)

- 1973-1977 IZUTSU, K., Dr.
Faculty of Science, Shinshu University, 3-1-1 Asahi, Matsumoto
390 (Japan)
- 1975-1979 MEITES, L., Prof.
Department of Chemistry, Clarkson College of Technology,
Potsdam, New York 13676 (USA)
- 1971-1977 PUNGOR, E., Prof.
Általános és Analitikai Kémiai Tanszék, Budapesti Műszaki
Egyetem, Gellért Tér 4, H-1502 Budapest (Hungary)
- 1975-1979 SONGINA, O. A., Prof.
Kasach University, Alma Ata (USSR)
- 1971-1977 TRÉMILLON, B., Prof.
Laboratoire de Chimie Analytique et d'Electrochimie, École
Nationale Supérieure de Chimie, Université de Paris VI, 11 Rue
Pierre et Marie Curie, F-75231 Paris Cedex 05 (France)

National Representatives

- Australia* PERRIN, D. D., Dr.
1971-1977 Medical Chemistry Group, John Curtin School of Medical
Research, Australian National University, POB 4, Canberra,
ACT 2600
- Federal Republic of Germany* KRAFT, G., Dr.
1972-1977 Metallgesellschaft AG, Reuterweg 14, D-6000 Frankfurt/Main
- India* KAPOOR, R. C., Prof.
1974-1977 Department of Chemistry, University of Jodhpur, Jodhpur 342001,
Rajasthan
- Japan* TANAKA, N., Prof.
1969-1977 Department of Chemistry, Faculty of Science, Tohoku University,
Aza Aoba, Aramaki, Sendai 980
- Poland* KEMULA, W., Prof.
1969-1977 Institut Chemii Fizycznej, Polska Akademii Nauk, Ul. Kasprzaka
44-52, PL 01-224 Warszawa
- United Kingdom* KANE, P. O., Dr.
1971-1977 Mond Division, Imperial Chemical Industries Ltd., POB 8,
Runcorn, Cheshire

V.6 COMMISSION ON EQUILIBRIUM DATA

(Established 1955)

Titular Members

Chairman

- 1971-1979 **NANCOLLAS, G. H., Prof.**
Department of Chemistry, State University of New York at Buffalo, Acheson Hall, Buffalo, New York 14214 (USA)
(TEL: 716-831-3014)

Secretary

- 1973-1977 **AHRLAND, S., Prof.**
Department of Inorganic Chemistry I, Chemical Center, University of Lund, POB 740, S-220 07 Lund 7 (Sweden)
(TEL: 046-124600)

Members

- 1973-1977 **ANDEREGG, G., Prof.**
Laboratorium für Anorganische Chemie der Eidgenössischen Technischen Hochschule Zürich, Universitätstrasse 6, CH-8006 Zürich (Switzerland)
- 1975-1979 **BECK, M. T., Prof.**
Institute of Physical Chemistry, Kossuth Lajos University, H-4010 Debrecen (Hungary)
- 1971-1979 **HÖGFELDT, E., Dr.**
Department of Inorganic Chemistry, Royal Institute of Technology, S-100 44 Stockholm 70 (Sweden)
- 1969-1977 **KERTES, A. S., Prof.**
Institute of Chemistry, Hebrew University of Jerusalem, Jerusalem (Israel)
- 1971-1979 **PERRIN, D. D., Dr.**
Medical Chemistry Group, John Curtin School of Medical Research, Australian National University, POB 4, Canberra, ACT (Australia 2600)
- 1971-1979 **STARÝ, J., Dr.**
Katedra Jaderné Chemie, Fakulta Jaderné a Fyzikálně Inženýrská, České Vysoké Učení Technické v Praze, Břehova Ul. 7, CS-110 00 Praha 1-Staré Mešto (Czechoslovakia)

Associate Members

- 1975-1979 **BATTINO, R., Prof.**
Department of Chemistry, Wright State University, Dayton, Ohio 45431 (USA)
- 1974-1977 **CLIFFORD, A. F., Prof.**
Department of Chemistry, Virginia Polytechnic Institute and State University, Blacksburg, Virginia 24061 (USA)
- 1975-1979 **FREISER, H., Prof.**
Department of Chemistry, University of Arizona, Tucson, Arizona 85721 (USA)

- 1973-1977 HUME, D. N., Prof.
Department of Chemistry, Massachusetts Institute of Technology,
Cambridge, Massachusetts 02139 (USA)
- 1973-1977 MARCUS, Y., Prof.
Institute of Chemistry, Hebrew University of Jerusalem, Jerusalem
(Israel)
- 1973-1977 OHTAKI, H., Prof.
Department of Electrochemistry, Tokyo Institute of Technology,
12-1, 0-Okayama 2-chome, Meguro-ku, Tokyo 152 (Japan)
- 1973-1977 YOUNG, C. L., Dr.
Department of Chemistry, University of Melbourne, Parkville,
Victoria (Australia 3052)

National Representatives

- Union of
Soviet
Socialist
Republics*
1976-1977 MAROV, I. N., Prof.
V I Vernadskii Institute of Geochemistry and Analytical Chemistry,
Academy of Sciences of USSR, Vorobyevskoye Chaussée 47-a,
117334 Moscow
- United
Kingdom*
1976-1977 IRVING, H. M. N. H., Prof.
1 North Grange Mount, Leeds LS6 2BY
- United
States of
America*
1969-1977 MARTELL, A. E., Prof.
Department of Chemistry, Texas A & M University, College
Station, Texas 77843

SUBCOMMITTEE ON SOLUBILITY DATA

Chairman

KERTES, A. S., Prof.

Institute of Chemistry, Hebrew University of Jerusalem, Jerusalem (Israel)

(TEL: 02-531-221)

Members

BARTON, A. F. M., Dr.

School of Physical Sciences, Murdoch University, Murdoch, Western Australia (Australia 6153)

BATTINO, R., Prof.

Department of Chemistry, Wright State University, Dayton, Ohio 45431 (USA)

CLEVER, H. L., Dr.

Department of Chemistry, Emory University, Atlanta, Georgia 30322 (USA)

CLIFFORD, A. F., Prof.

Department of Chemistry, Virginia Polytechnic Institute and State University, Blacksburg, Virginia 27061 (USA)

DANCY, E. A., Dr.

Materials Science Research IREQ, 1800 Montee Ste-Julie, Varennes, Quebec J0L 2P0 (Canada)

DAVIS, S. S., Prof.

Department of Pharmacy, University of Nottingham, Nottingham (UK)

ELIEZER, I., Prof.

Department of Chemical Physics, Weizmann Institute of Science, Rehovot (Israel)

GERRARD, W., Prof.

15 Oakroyd Close, Potters Bar, Hertfordshire EN6 2EW (UK)

HUYSKENS, P., Prof.

Department of Physical Chemistry, University of Louvain, B-3030 Heverlee (Belgium)

NANCOLLAS, G. H., Prof.

Department of Chemistry, State University of New York at Buffalo, Acheson Hall, Buffalo, New York 14214 (USA)

SIGWORTH, G. K., Dr.

Department of Metallurgy and Materials Science, Carnegie-Mellon University, Schenley Park, Pittsburgh, Pennsylvania 15213 (USA)

WILHELM, E., Dr.

Institut für Physikalische Chemie der Universität Wien, Währingerstrasse 42, A-1090 Wien (Austria)

YOUNG, C. L., Dr.

Department of Chemistry, University of Melbourne, Parkville, Victoria (Australia 3052)

SUBCOMMITTEE ON STABILITY CONSTANT DATA

Chairman

PERRIN, D. D., Dr.
Medical Chemistry Group, John Curtin School of Medical
Research, Australian National University, POB 4, Canberra,
ACT (Australia 2600)
(TEL: 49-5111)

Members

DEMPSEY, B., Prof.
Faculty of Military Studies, University of New South Wales,
Duntroon, ACT (Australia 2600)

HÖGFELDT, E., Dr.
Department of Inorganic Chemistry, Royal Institute of
Technology, S-100 44 Stockholm 70 (Sweden)

OHTAKI, H., Prof.
Department of Electrochemistry, Tokyo Institute of Technology,
12-1, 0-Okayama 2-chome, Meguro-ku, Tokyo 152 (Japan)

SERJEANT, P., Dr.
Faculty of Military Studies, University of New South Wales,
Duntroon, ACT (Australia 2600)

WESTRUM, Jr., E. F., Prof.
Department of Chemistry, University of Michigan, Ann Arbor,
Michigan 48104 (USA)

YATZIMIRSKII, K. B., Prof.
L V Pissarzhevskii Institute of Physical Chemistry, Academy of
Sciences of Ukrainian SSR, Prospect Nauki 97, Kiev 28 (USSR)

V.7 COMMISSION ON ANALYTICAL RADIO-CHEMISTRY AND NUCLEAR MATERIALS

(Established 1965)

Titular Members

Chairman

- 1969-1977 WAINERDI, R. E., Prof.
Center for Energy and Mineral Resources, Olin E Teague Hall,
Texas A & M University, College Station, Texas 77843 (USA)
(TEL: 713-845-4016)

Secretary

- 1971-1979 SAITO, N., Prof.
Department of Chemistry, Faculty of Science, University of Tokyo,
3-1 Hongo 7-chome, Bunkyo-ku, Tokyo 113 (Japan)
(TEL: 03-812-2111)

Members

- 1971-1979 GIRARDI, F., Dr.
Chemistry Division, Commission des Communautés
Européennes — EURATOM, I-21020 Ispra (Varese) (Italy)
- 1973-1977 HOSTE, J., Prof.
Instituut voor Nucleaire Wetenschappen, Rijksuniversiteit Ghent,
Proeftuinstraat 40, B-9000 Ghent (Belgium)
- 1969-1977 KOSTA, L., Prof.
Oddelek za Kemijo Univerze v Ljubljani, Murnikova 6, POB 537,
YU-61000 Ljubljana (Yugoslavia)
- 1975-1979 RAFTER, T. A., Dr.
Institute of Nuclear Sciences, Department of Scientific and
Industrial Research, Private Bag, Lower Hutt (New Zealand)
- 1973-1977 SANKAR DAS, M., Dr.
Analytical Chemistry Division, Bhabha Atomic Research Centre,
Trombay, Bombay 400085 (India)
- 1973-1979 SMALES, A. A., Dr.
72 Wolsingham Drive, Stainsby Hill, Old Thornaby, Cleveland
(UK)

Associate Members

- 1971-1977 COMAR, D., Dr.
Service Hospitalier Frédéric Joliot, Département de Biologie,
Centre d'Études Nucléaires de Saclay, F-91406 Orsay (France)
- 1971-1977 COOK, G. B., Dr.
Seibersdorf Laboratory, International Atomic Energy Agency,
A-2444 Niederösterreich (Austria)
- 1975-1979 CRESPI, M. B. A., Dr.
Comisión Nacional de Energía Atómica, Avenida del Libertador
8250, Buenos Aires (Argentina)

1973-1977 LUX, F., Prof.
Institut für Radiochemie der Technischen Universität München,
D-8046 Garching (Federal Republic of Germany)

1971-1977 STEINNES, E., Dr.
Institutt for Atomenergi, POB 40, N-2007 Kjeller (Norway)

National Representatives

Federal LIESER, K. H., Prof.
Republic of Fachbereich Anorganische Chemie und Kernchemie der
Germany Technischen Hochschule, D-6100 Darmstadt
1975-1977

Hungary SZABO, E., Dr.
1971-1977 Central Research Institute for Physics, Hungarian Academy of
Sciences, Konkoly-Thege Út, Budapest XII

Netherlands DE BRUIN, M., Ir.
1973-1977 Interuniversity Reactor Institute, Mekelweg 15, Delft

VI APPLIED CHEMISTRY DIVISION

(Established 1949)

DIVISION COMMITTEE

President

- 1971-1977 EGAN, H., Dr.
Laboratory of the Government Chemist, Department of Industry,
Cornwall House, Stamford Street, London SE1 9NQ (UK)
(TEL: 01-928-7900)

Vice-President (President-Elect)

- 1971-1977 SUOMALAINEN, H., Prof.
Finnish State Alcohol Monopoly (Alko), POB 350, SF-00101
Helsinki 10 (Finland)
(TEL: 642911. TELEX: 12-1045)

Vice-President

- 1973-1977 STOLL, W. G., Dr.
CIBA - GEIGY AG, CH-4002 Basel (Switzerland)
(TEL: 061-325011. TELEX: 62991)

Secretary

- 1973-1977 COLLINGS, A. J., Dr.
Inveresk Research International, Inveresk Gate, Musselburgh,
Midlothian EN21 7UB (UK)
(TEL: Tranent 610523)

Members

- 1973-1977 EPSTEIN, J. A., Dr.
Dead Sea Works Ltd., Potash House, POB 75, Beer-Sheba (Israel)
- 1975-1979 FREHSE, H., Dr.
Pflanzenschutz, Anwendungstechnik, Biologische Forschung,
Bayer AG, D-5090 Leverkusen-Bayerwerk (Federal Republic of
Germany)
- 1975-1979 FREYSCHUSS, S., Dr.
Institutet för Vatten- och Luftvårdsforskning, Hälsingegatan 43,
POB 21060, S-100 31 Stockholm (Sweden)
- 1973-1977 LANGLYKKE, A. F., Dr.
Frederick Cancer Research Center, POB B, Frederick, Maryland
21701 (USA)
- 1975-1979 MARCUSE, R., Dr.
SIK-Swedish Food Institute, Fack, S-400 21 Göteborg 16 (Sweden)
- 1975-1979 REYMOND, D., Prof.
Nestlé Products Technical Assistance Co. Ltd., Case Postale 88,
CH-1814 La Tour de Peilz (Switzerland)

Coopted Members

HILL, K. R., Dr.

Analytical Chemistry Laboratory, Agricultural Environmental
Quality Institute, US Department of Agriculture, Beltsville,
Maryland 20705 (USA)

TONKS, D. B., Prof.

Division of Clinical Chemistry, Montreal General Hospital,
1650 Cedar Avenue, Montreal, Quebec H3G 1A4 (Canada)

VI.1 COMMISSION ON FOOD ADDITIVES

(Established in its present form 1971)

Titular Members

Chairman

- 1971-1979 HAENNI, E. O., Dr.
7907 Glenbrook Road, Bethesda, Maryland 20014 (USA)
(TEL: 301-652-3108)

Secretary

- 1967-1977 WASSERMAN, A. E., Dr.
Agricultural Research Service, US Department of Agriculture,
600 E Mermaid Lane, Philadelphia, Pennsylvania 19118 (USA)
(TEL: 215-248-5000)

Members

- 1975-1979 DODGEN, D. F., Mr.
Food Chemicals Codex, National Academy of Sciences, National
Research Council, 2101 Constitution Avenue, Washington, DC
20418 (USA)
- 1971-1979 GRIMMER, G., Prof.
Bebelallee 30 A, D-2000 Hamburg 39 (Federal Republic of
Germany)
- 1975-1979 KUBACKI, S. J., Dr.
Department of Instrumental Analysis, Institute of Fermentation
Industry, Ul. Rakowiecka 36, Warszawa 12 (Poland)
- 1975-1977 MARCUSE, R., Dr.
SIK-Swedish Food Institute, Fack, S-400 21 Göteborg 16 (Sweden)
- 1975-1979 NIKONOROW, M., Prof.
Państwowy Zakład Higieny, Ul. Chocimska 24, PL 00-791
Warszawa (Poland)
- 1975-1979 SCHATZ, B. A., Mr.
AB Felix, POB 16, S-241 00 Eslöv (Sweden)

Associate Members

- 1975-1979 BALTES, W., Prof.
Institut für Lebensmittelchemie der Technischen Universität,
Strasse des 17 Juni 1935, D-1000 Berlin 12 (Federal Republic of
Germany)
- 1975-1979 BERGSTRØM-NIELSEN, M., Dr.
Statens Levnedsmiddelinstitut, Mørkhøj Bygade 19, DK-2860
Søborg (Denmark)
- 1975-1977 BILLEK, G., Prof.
Unilever Forschungsgesellschaft mbH, Behringstrasse 154,
Postfach 1568, D-2000 Hamburg 50 (Federal Republic of Germany)

- 1975-1977 COFFIN, D. E., Dr.
Food Research Division, Bureau of Chemical Safety, Foods
Directorate, Health Protection Branch, Department of National
Health and Welfare, Tunney's Pasture, Ottawa, Ontario K1A 0L2
(Canada)
- 1971-1977 EDHBORG, A., Dr.
AB Findus, POB 85, Fack, S-267 00 Bjuv (Sweden)
- 1975-1979 KAUFFMAN, F. L., Dr.
HFF-410, Division of Food Technology, Food and Drug
Administration, US Department of Health, Education, and
Welfare, 200 C Street SW, Washington, DC 20204 (USA)
- 1973-1977 McDONALD, I. R. C., Mr.
Division of Chemistry, Department of Scientific and Industrial
Research, Private Bag, Petone (New Zealand)
- 1971-1977 WALKER, E. A., Mr.
Unit of Environmental Carcinogens, International Agency for
Research on Cancer, 150 Cours Albert Thomas, F-69008 Lyon
(France)

National Representatives

- Czecho-
slovakia* DAVÍDEK, J., Prof.
1976-1977 Faculty of Food and Biochemical Technology, Suchbátarova 1905,
CS-166 28 Praha 6-Dejvice
- Federal
Republic of
Germany* LÜCK, E.
1975-1977 Hoechst AG, Postfach 800320, D-6230 Frankfurt/Main 80
- Hungary* VAS, K., Prof.
1975-1977 Központo Élelmiszeripari Kutató Intézet, Herman Otto Út 15,
Budapest II
- Poland* RUTKOWSKI, A., Prof.
1975-1977 Instytut Technologii Żywności, Akademia Rolnicza, Ul.
Rakowiecka 26-30, PL 02-528 Warszawa

VI.2 COMMISSION ON FOOD CONTAMINANTS

(Established in its present form 1971)

Titular Members

Chairman

- 1973-1977 KOJIMA, K., Dr.
Laboratory for Medicinal Plants, National Institute of Hygienic Science, Higashi 2-8-65, Kasukabe, Kasukabe-shi, Saitama-ken 344 (Japan)
(TEL: 0487-52-2077)

Secretary

- 1971-1977 OHNO, K., Dr.
Central Research Laboratory, Showa Denko KK, 24-60 2-chome Tamagawa, Ota-ku, Tokyo 144 (Japan)
(TEL: 03-733-0151)

Members

- 1973-1977 CAMPBELL, A. D., Dr.
HFF-107, Food and Drug Administration, US Department of Health, Education, and Welfare, 200 C Street SW, Washington, DC 20204 (USA)
- 1975-1979 COLES, L. E., Dr.
County Public Health Laboratory, Institute of Preventive Medicine, The Parade, Cardiff CF2 3VJ (UK)
- 1975-1979 JEMMALI, M., Dr.
Station de Biochimie et Physico-Chimie des Céréales, Institut National de la Recherche Agronomique, 16 Rue Nicolas Fortin, F-75013 Paris (France)
- 1971-1979 KROGH, P., Dr.
Institute of Hygiene and Microbiology, Royal Veterinary and Agricultural University, 13 Bülowsvej, DK-1870 København V (Denmark)
- 1973-1977 SCHULLER, P. L., Dr.
Rijks Instituut voor der Volksgezondheid, Antonie van Leeuwenhoeklaan 9, POB 1, Bilthoven (Netherlands)
- 1975-1979 TRACEY, M. V., Mr.
Division of Food Research, Commonwealth Scientific and Industrial Research Organization, Delhi Road, POB 52, North Ryde, New South Wales (Australia 2113)

Associate Members

- 1975-1979 BRO-RASMUSSEN, F., Mr.
Statens Levnedsmiddelinstitut, Mørkhøj Bygade 19, DK-2860 Søborg (Denmark)
- 1975-1979 COLLINGS, A. J., Dr.
Inveresk Research International, Inveresk Gate, Musselburgh, Midlothian EN21 7UB (UK)

- 1975-1979 GUTHENBERG, H., Dr.
Kungl Generaltullstyrelsen, Fack, S-103 10 Stockholm 2 (Sweden)
- 1975-1979 KRÖNERT, W., Dr.
Max-von-Pettenkofer-Institut des Bundesgesundheitsamtes,
Unter den Eichen 82-84, D-1000 Berlin 33 (Federal Republic of
Germany)
- 1973-1977 LITTLEHAILES, J. D., Dr.
Agricultural Division, Imperial Chemical Industries Ltd., POB 1,
Billingham, Teesside TS23 1LB (UK)
- 1973-1977 STEYN, P. S., Dr.
National Chemical Research Laboratory, Council for Scientific
and Industrial Research, POB 395, Pretoria 0001 (Republic of
South Africa)
- 1975-1979 TRUHAUT, R., Prof.
Laboratoires de Toxicologie et d'Hygiène Industrielle, Faculté
des Sciences Pharmaceutiques et Biologiques de Paris
Luxembourg, Université René Descartes, 4 Avenue de
l'Observatoire, F-75006 Paris Cedex 06 (France)

COORDINATING COMMITTEE ON FOOD CHEMISTRY

Chairman

MARCUSE, R., Dr.
SIK-Swedish Food Institute, Fack, S-400 21 Göteborg 16 (Sweden)
(TEL: 031-400120)

Secretary

SCHATZ, B. A., Mr.
AB Felix, POB 16, S-241 00 Eslöv (Sweden)
(TEL: 0413-13100)

Members

COLLINGS, A. J., Dr.
Inveresk Research International, Inveresk Gate, Musselburgh,
Midlothian EN21 7UB (UK)

HAENNI, E. O., Dr.
7907 Glenbrook Road, Bethesda, Maryland 20014 (USA)

KAUFFMAN, F. L., Dr.
HFF-410, Division of Food Technology, Food and Drug
Administration, US Department of Health, Education, and
Welfare, 200 C Street SW, Washington, DC 20204 (USA)

KOJIMA, K., Dr.
Laboratory for Medicinal Plants, National Institute of Hygienic
Sciences, Higashi 2-8-65, Kasukabe, Kasukabe-shi, Saitama-ken
344 (Japan)

OHNO, K., Dr.
Central Research Laboratory, Showa Denko KK, 24-60 2-chome
Tamagawa, Ota-ku, Tokyo 144 (Japan)

WASSERMAN, A. E., Dr.
Agricultural Research Service, US Department of Agriculture, 600
E Mermaid Lane, Philadelphia, Pennsylvania 19118 (USA)

VI.3 COMMISSION ON FERMENTATION

(Established in its present form 1975)

Titular Members

Chairman

- 1973-1977 HUMPHREY, A. E., Prof.
107 Towne Building-D3, College of Engineering and Applied
Science, University of Pennsylvania, Philadelphia, Pennsylvania
19174 (USA)
(TEL: 215-594-7245)

Vice-Chairman

- 1975-1979 DELLWEG, H., Prof.
Institut für Gärungsgewerbe und Biotechnologie, Seestrassse 13,
D-1000 Berlin 65 (Federal Republic of Germany)
(TEL: 030-453011)

Secretary

- 1967-1977 HOOGERHEIDE, J. C., Dr.
Laan van Clingendael 129, 's Gravenhage (Netherlands)
(TEL: 070-240635)

Members

- 1969-1977 ERTOLA, R. J., Dr.
Facultad de Ciencias Exactas, Universidad Nacional de la Plata,
Casilla de Correo 281, La Plata (Argentina)
- 1975-1979 HOLLÓ, J., Prof.
Mezőgazdasági Kémiai Technológiai Tanszék, Budapesti
Műszaki Egyetem, Gellért Tér 4, H-1521 Budapest XI (Hungary)
- 1969-1977 MÁLEK, I., Acad.
Na Dolinách 18, CS-147 00 Praha 48 (Podolí) (Czechoslovakia)
- 1975-1979 RIGHELATO, R. C., Dr.
Philip Lyle Memorial Research Laboratory, University of
Reading, POB 68, Reading, Berkshire (UK)
- 1975-1979 YAMADA, K., Dr.
Sapporo Breweries Ltd., 4-1 Mita 1-chome, Meguro-ku, Tokyo
153 (Japan)

Associate Members

- 1975-1979 EROSHIN, V. K., Dr.
Institute of Biochemistry and Physiology of Microorganisms,
Academy of Sciences of USSR, Pushchino-na-Oka, Moscow
(USSR)
- 1975-1979 FIECHTER, A., Prof.
Mikrobiologisches Institut der Eidgenössischen Technischen
Hochschule Zürich, Weinbergstrasse 38, CH-8006 Zürich.
Weinbergstrasse 38, CH-8006 Zürich (Switzerland)
- 1972-1977 GHOSE, T. K., Prof.
Department of Chemical Engineering, Indian Institute of
Technology, Hauz Khas, New Delhi 16 (India)

- 1972-1977 LAINE, B. M., Mr.
BP Proteins Ltd., Britannic House, Moor Lane, London EC2Y
9BU(UK)
- 1971-1977 PARISI, F., Dr.
Società Chimica Italiana -Sezione Lambarda, Piazzale Rodolfo
Morandi 2, I-20121 Milano (Italy)
- 1975-1979 PIRT, S. J., Prof.
Department of Microbiology, Sir John Atkins Laboratories,
Queen Elizabeth College, Campden Hill, London W8 7AH (UK)
- 1973-1977 RALPH, B. P., Dr.
School of Biological Technology, University of New South Wales,
POB 1, Kensington, Sydney (Australia 2033)
- 1975-1979 TAKAHASHI, G., Prof.
Faculty of Agriculture, Tokyo University of Education, 2-19-1
Komaba, Meguro-ku, Tokyo 153 (Japan)

National Representatives

- Austria* WUTZEL, H., Ing.
1974-1977 Bundeslehr- und Versuchsanstalt für Chemische Industrie,
Rosensteingasse 79, A-1170 Wien
- Federal Republic of Germany* BRONN, W. K., Mr.
1974-1977 Institut für Gärungsgewerbe und Biotechnologie, Seestrasse 13,
D-1000 Berlin 65
- United States of America* LANGLYKKE, A. F., Dr.
1976-1977 Frederick Cancer Research Center, POB B, Frederick, Maryland
21701

VI.4 COMMISSION ON OILS AND FATS

(Established in its present form 1975)

Titular Members

Chairman

- 1963-1977 VOS, H. J., Drs.
Populierenlaan 1a, NL-2660 Bosch en Duin (Netherlands)
(TEL: 03404-31703)

Secretary

- 1973-1977 PAQUOT, C., Prof.
Groupe de Laboratoires du Centre National de la Recherche Scientifique, 2-8 Rue Henri Dunant, F-94320 Thiais (France)
(TEL: 726-0840)

Members

- 1973-1977 BRÜSCHWEILER, H., Dr.
Eidgenössische Matrialprüfungs- und Versuchsanstalt für Industrie, Bauwesen und Gewerbe, Unterstrasse 11, CH-9001 Saint-Gallen (Switzerland)
- 1973-1977 DELVAUX, E. L., Prof.
Leo Dartelaan 27, B-3030 Heverlee (Belgium)
- 1975-1979 FIRESTONE, D., Dr.
HFF-140, Bureau of Foods, Food and Drug Administration, US Department of Health, Education, and Welfare, 200 C Street SW, Washington, DC 20204 (USA)
- 1973-1977 GRACIAN TOUS, J., Dr.
Instituto de la Grasa y sus Derivados, Consejo Superior de Investigaciones Científicas, Avenida Padre García Tejero 4, Sevilla (Spain)
- 1973-1977 MØLLER, A. T., Mr.
Aarhus Oliefabrik A/S, DK-8100 Aarhus C (Denmark)
- 1973-1977 VAN DER WEEL, J. C., Drs.
Unilever-Emery NV, Buurtje 1, POB 2, NL-2300 Gouda (Netherlands)

Associate Members

- 1975-1979 ASAHARA, T., Prof.
Shibaura Institute of Technology, 9-34 Shibaura 3-chome, Minato-ku, Tokyo 108 (Japan)
- 1975-1979 CAROLA, C., Ing.
Stazione Sperimentale per le Industrie degli Oli e dei Grassi, Via Guiseppe Colombo 79, I-20135 Milano (Italy)
- 1975-1979 CONNOLLY, J. F., Dr.
Animal Production Research Centre, Agricultural Institute, Dunsinea, Castleknock, County Dublin (Ireland)
- 1975-1979 CORNELIUS, J. A., Dr.
Tropical Products Institute, 56-62 Gray's Inn Road, London WC1X 8LU (UK)

- 1975-1979 GULLBRANDSON, B., Dr.
AB Helios Kemisk-Tekniska Fabriker, POB 32025, S-126 11
Stockholm (Sweden)
- 1975-1979 HADORN, H., Dr.
Coop Schweiz, Zentrallabor, Thiersteinallee 14, CH-4002 Basel
(Switzerland)
- 1975-1979 MARTINEZ-MORENO, J., Prof.
Instituto de la Grasa y sus Derivados, Consejo Superior de
Investigaciones Científicas, Avenida Padre García Tejero 4,
Sevilla (Spain)
- 1975-1979 NAUDET, M., Prof.
Laboratoire National des Matières Grasses, Institut de Chimie des
Corps Gras, Faculté des Sciences, Université de Provence, Place
Victor Hugo, F-13331 Marseille Cedex 3 (France)
- 1975-1979 PETERSEN, A., Mr.
De Danske Spritfabrikker, Raffinaderivej 10, POB 1256, DK-2300
København S (Denmark)
- 1975-1979 RUTKOWSKI, A., Prof.
Instytut Technologii Żywności, Akademia Rolnicza, Ul.
Rakowiecka 26-30, PL 02-528 Warszawa (Poland)
- 1975-1979 WESSELS, H., Prof.
Bundesanstalt für Fettforschung, Piusallee 68-76, D-4400
Münster (Federal Republic of Germany)
- 1975-1979 WOLFF, J. P., Mr.
Laboratoires Wolff, 198 Avenue du Belvédère, F-75019 Paris
(France)

National Representatives

- Argentina* CATTANEO, P., Prof.
1971-1977 Instituto Argentino de Racionalización de Materiales, Calle Chile
No. 1192, Buenos Aires
- Australia* JOHNSON, A. R., Dr.
1976-1977 Department of Nutrition, Sir John Atkins Laboratories, Queen
Elizabeth College, Campden Hill, London W8 7AH
- Austria* CZEDIK-EYSENBERG, P. B., Dr.
1974-1977 Ketzergrasse 471, A-1230 Wien-Rodaun
- Belgium* HAUTFENNE, A., Dr.
1974-1977 22 Avenue des Grenadiers, B-1330 Rixensart
- 1971-1977 JACOBSBERG, B., Miss
Tropical Products Sales, 46 Rue Montoyer, B-1040 Bruxelles
- Bulgaria* CHOBANOV, D., Dr.
1975-1977 Institute of Organic Chemistry, Bulgarian Academy of Sciences,
Sofia 13
- Canada* BEARE-ROGERS, J., Dr.
1976-1977 Health Protection Branch, Department of National Health and
Welfare, Tunney's Pasture, Ottawa, Ontario K1A 0L2

- 1972-1977 CRAIG, B. M., Dr.
Prairie Regional Laboratory, National Research Council of
Canada, Saskatoon, Saskatchewan
- Czechoslovakia* POKORNÝ, J., Dr.
Katedra Chemie a Zkoušení Potravin, Vysoké Školy Chemiko-
1971-1977 Technologické v Praze, Suchbátarova 5, CS-166 28 Praha
6-Dejvice
- Denmark* LINTZ CHRISTENSEN, S. B., Mr.
1971-1977 Dansk Sojakefabrik A/S, 24 Islands Brygge, DK-2300
København S
- Federal Republic of Germany* TEUPEL, M., Dr.
Henkel & Cie. GmbH, Postfach 1100, D-4000 Düsseldorf 1
1971-1977
- 1971-1977 WENDT, H. H. R. H., Dr.
Margarine-Union GmbH, Friedensallee 333, D-2000 Hamburg 50
- Hungary* HOLLÓ, J., Prof.
1971-1977 Mezőgazdasági Kémiai Technológiai Tanszék, Budapesti Műszaki
Egyetem, Gellért Tér 4, H-1521 Budapest XI
- 1974-1977 KURUCZ, E., Dr.
Növényolaj-És Mosószeripari Kutató Intézet, Maglódi Út 6,
H-1106 Budapest X
- India* KANE, J. G., Prof.
1971-1977 Department of Chemical Technology, University of Bombay,
Matunga Road, Bombay-19
- Ireland* McGWYNNE, B. M., Mr.
1971-1977 Irish Oil Cake Mills Ltd., Marsh Road, Drogheda, County Louth
- 1972-1977 REYNOLDS, D. C., Mr.
Lever Bros. (Ireland) Ltd., 68 Upper Sheriff Street, Dublin 1
- Italy* MONACELLI, R., Prof.
1971-1977 Istituto Superiore di Sanità, Viale Regina Elena 299, I-00161 Roma
- 1976-1977 TISCORNIA, E., Prof.
Istituto Chimica Farmaceutica Università, Viale Benedetto XV/3,
I-16132 Genoa
- Japan* HASHIMOTO, T., Dr.
1974-1977 National Chemical Laboratory for Industry, Ministry of
International Trade and Industry, 1-5 Honmachi 1, Shibuya-ku,
Tokyo 151
- Netherlands* HENDRIKSE, P. W., Drs.
1973-1977 Unilever Research Laboratorium, POB 114, Vlaardingen
- New Zealand* PATTINSON, M. E., Mr.
Abels Ltd., 101 Carlton Gore Road, POB 9573, Newmarket,
1976-1977 Auckland
- 1971-1977 SHORLAND, F. B., Dr.
POB 2447, Wellington
- Norway* GRIMSVANG, T., Mr.
1976-1977 De-No-Fa og Lilleborg Fabrikker A/S, N-1601 Fredrikstad

- Poland* JAKUBOWSKI, A., Dr.
1971-1977 Instytut Przemysłu Tłuszczowego, Ul. Rakowiecká 36,
Warszawa 12
- 1971-1977 NIEWIADOMSKI, H., Prof.
Organicznej Oraz Żywnościowej, Instytut Chemii i Technologii
Politechnika Gdańska, Ul. Majakowskiego 11-12, Gdańsk-
Wrzeszcz
- Spain* GASSIOT-MATAS, M., Prof.
1971-1977 Instituto Químico de Sarriá, Barcelona-17
- Sweden* LEVIN, Ö., Dr.
1971-1977 Margarinbolaget AB, Fack, S-104 25 Stockholm 30
- 1971-1977 OHLSON, R., Dr.
Research Laboratory, AB Karlshamns Oljefabriker, S-292 00
Karlshamn
- Switzerland* DIEFFENBACHER, A., Dr.
1973-1977 Oel- und Fettwerke SALS, CH-9326 Horn
- United Kingdom* LEWKOWITSCH, P. R. E., Dr.
1971-1977 71 Priory Road, West Hampstead, London NW6 3NH
- 1974-1977 WILLIAMS, K. A., Dr.
Ormond House, 7-8 Hardwick Street, Roseberry Avenue,
London EC1R 4RB
- United States of America* EMBREE, N. D., Dr.
1976-1977 1139 Knollwood Lane, Kingsport, Tennessee 37660
- 1976-1977 LINK, W. E., Dr.
Research and Development Division, Ashland Oil Inc., POB 2458,
Columbus, Ohio 43216

WORKING GROUPS OF COMMISSION ON OILS AND FATS

WG 2 Determination of Total Oxidized Fatty Acids by TLC and Densitometry

Prof. M. NAUDET (Chairman - France), Ing. C. CAROLA (Italy), Mme. J. CASTANG (France), Dr. J. GRACIAN TOUS (Spain), Miss B. JACOBBERG (Belgium), Mr. A. KARLESKIND (France), Dr. E. KURUCZ (Hungary), Mr. S. B. LINTZ CHRISTENSEN (Denmark), Mr. A. T. MØLLER (Denmark), Dr. J. POKORNÝ (Czechoslovakia), Mr. A. PREVOT (France), Prof. A. RUTKOWSKI (Poland), Drs. H. J. VOS (Netherlands)

WG 3 Determination of Tocopherols (free and esterified) in Oils, Fats, and Margarine

Drs. P. W. HENDRIKSE (Chairman - Netherlands), Ing. C. CAROLA (Italy), Mme. J. CASTANG (France), Mme. C. COURCELLES (France), Prof. E. L. DELVAUX (Belgium), Dr. N. D. EMBREE (USA), Dr. J. GRACIAN TOUS (Spain), Miss B. JACOBBERG (Belgium), Prof. M. NAUDET (France), Dr. R. OHLSON (Sweden), Prof. C. PAQUOT (France), Dr. H. T. SLOVER (USA), Mr. F. ZWOBADA (France)

WG 4 Determination of Chlorinated Pesticides in Oils and Fats

Prof. E. L. DELVAUX (Chairman - Belgium), Prof. T. ASA—HARA (Japan), Mme. J. CASTANG (France), Dr. D. FIRESTONE (USA), Dr. J. GRACIAN TOUS (Spain), Dr. P. A. GREVE (Netherlands), Dr. T. HASHIMOTO (Japan), Mr. A. T. MØLLER (Denmark), Prof. R. MONACELLI (Italy), Dr. R. OHLSON (Sweden), Ing. L. G. M. TH. TUINSTRA (Netherlands), Ing. R. H. de VOS (Netherlands), Dr. H. H. R. H. WENDT (Federal Republic of Germany), Dr. K. A. WILLIAMS (UK), Mr. J. P. WOLFF (France)

WG 5 Determination of Content of cis-cis Linoleic Acid of Oils, Fats, and Margarine

Dr. Ö. LEVIN (Chairman - Sweden), Dr. J. BEARE-ROGERS (Canada), Mme. J. CASTANG (France), Dr. D. CHOBANOV (Bulgaria), Mme. C. COURCELLES (France), Prof. J. HOLLÓ (Hungary), Drs. P. W. HENDRIKSE (Netherlands), Dr. A. JAKUBOWSKI (Poland), Mr. A. KARLESKIND (France), Prof. M. NAUDET (France), Dr. A. J. SHEPPARD (USA), Drs. H. J. VOS (Netherlands), Prof. H. WESSELS (Federal Republic of Germany), Mr. J. P. WOLFF (France)

WG 6 Determination of Oil Content of Oil Seeds by NMR Techniques

Mr. J. P. WOLFF (Chairman - France), Dr. J. A. CORNELIUS (UK), Drs. P. W. HENDRIKSE (Netherlands), Dr. A. JAKUBOWSKI (Poland), Mr. A. T. MØLLER (Denmark), Prof. M. NAUDET (France), Drs. H. J. VOS (Netherlands), Dr. K. A. WILLIAMS (UK)

- WG 7 Changes Taking Place in Oils and Fats during Deep Fat Frying**
 Prof. H. WESSELS (Chairman - Federal Republic of Germany), Mme J. CASTANG (France), Miss B. JACOBSBERG (Belgium), Mr. S. B. LINTZ CHRISTENSEN (Denmark), Prof. M. NAUDET (France), Mr. A. PETERSEN (Denmark), Dr. J. POKORNÝ (Czechoslovakia), Mr. A. PREVOT (France), Prof. A. RUTKOWSKI (Poland), Mr. F. ZWOBADA (France)
- WG 8 Identification and Determination of Emulsifiers (derived from fatty material) in Oils, Fats, Fat Products, and Cosmetics**
 Dr. H. BRÜSCHWEILER (Chairman - Switzerland), Dr. D. FIRESTONE (USA), Dr. A. HAUTFENNE (Belgium), Dr. E. KURUCZ (Hungary), Mr. A. T. MØLLER (Denmark), Prof. R. MONACELLI (Italy), Dr. R. OHLSON (Sweden), Dr. M. TEUPEL (Federal Republic of Germany), Drs. H. J. VOS (Netherlands), Dr. H. H. R. H. WENDT (Federal Republic of Germany), Dr. K. A. WILLIAMS (UK)
- WG 9 Revision of Methods published in 5th Edition* and Supplements: Publication of 6th Edition**
 Prof. C. PAQUOT (Chairman - France), Prof. E. L. DELVAUX (Belgium), Dr. P. R. E. LEWKOWITSCH (UK), Dr. W. LINK (USA), Mr. A. T. MØLLER (Denmark), Drs. H. J. VOS (Netherlands), Mr. J. P. WOLFF (France)
- WG 10 Realization of Proposed Activities on Soaps and Oleochemicals**
 Mr. A. T. MØLLER (Chairman - Denmark), Dr. J. BEARE-ROGERS (Canada), Dr. H. BRÜSCHWEILER (Switzerland), Ing. C. CAROLA (Italy), Dr. D. CHOBANOV (Bulgaria), Dr. J. GRACIAN TOUS (Spain), Dr. T. HASHIMOTO (Japan), Dr. A. HAUTFENNE (Belgium), Dr. E. KURUCZ (Hungary), Dr. W. LINK (USA), Dr. R. OHLSON (Sweden), Mr. D. C. REYNOLDS (Ireland), Prof. A. RUTKOWSKI (Poland), Dr. M. TEUPEL (Federal Republic of Germany), Drs. J. C. VAN DER WEEL (Netherlands), Dr. K. A. WILLIAMS (UK), Mr. J. P. WOLFF (France)
- WG 11 Determination of Total Fat Content of Margarine**
 Prof. M. NAUDET (Chairman - France), Dr. J. BEARE-ROGERS (Canada), Prof. E. L. DELVAUX (Belgium), Dr. D. FIRESTONE (USA), Mr. R. GUILLAUMIN (France), Dr. E. KURUCZ (Hungary), Dr. O. LEVIN (Sweden), Prof. R. MONACELLI (Italy), Dr. R. OHLSON (Sweden), Mr. A. PETERSEN (Denmark), Drs. H. J. VOS (Netherlands), Dr. H. H. R. H. WENDT (Federal Republic of Germany)

*Standard Methods for Analysis of Oils, Fats, and Soaps: 5th Edition (1964), Butterworths.

- WG 12 Determination of Plastic Polymers in Oils and Fats**
Drs. J. C. VAN DER WEEL (Chairman - Netherlands), Dr. D. FIRESTONE (USA), Mr. A. T. MØLLER (Denmark), Dr. M. TEUPEL (Federal Republic of Germany)
- WG 13 Determination of Plastic-based Contaminants (other than polyethylene) in Oils and Fats**
Dr. Ö. LEVIN (Chairman - Sweden), Dr. D. FIRESTONE (USA)
- WG 14 Revision of Determination of Unsaponifiable Matter: Method II.D.5**
Prof. M. NAUDET (Chairman - France), Dr. H. BRÜSCH-WEILER (Switzerland), Ing. C. CAROLA (Italy), Mme. J. CASTANG (France), Mme. C. COURCELLES (France), Mr. J. DIZIER (France), Mr. A. KARLESKIND (France), Dr. E. KURUCZ (Hungary), Dr. R. OHLSON (Sweden), Mr. A. PREVOT (France), Prof. A. RUTKOWSKI (Poland), Dr. M. TEUPEL (Federal Republic of Germany), Drs. H. J. VOS (Netherlands), Drs. J. C. VAN DER WEEL (Netherlands), Dr. K. A. WILLIAMS (UK), Mr. F. ZWOBADA (France)

VI.5 COMMISSION ON AIR QUALITY

(Established in its present form 1975)

Titular Members

Chairman

- 1973-1977 PILZ, W., Prof.
Institut für Klinische Chemie und Analytische Chemie der
Ärztlichen Abteilung, Bayer AG, D-5090 Leverkusen-Bayerwerk
(Federal Republic of Germany)
(TEL: 02172-306711)

Secretary

- 1975-1979 DROPE, E., Dr.
Bayer AG, IN AP MSR, D-5090 Leverkusen-Bayerwerk (Federal
Republic of Germany)
(TEL: 02172-305646)

Members

- 1973-1977 FUGAŠ, M., Dr.
Institute for Medical Research and Occupational Health, Moše
Pijade 158, YU-41000 Zagreb (Yugoslavia)
- 1973-1977 LUXON, S. G., Mr.
Branch 5, Nuclear Installation Inspectorate, Room 1601 A, Thames
House South, Millbank, London SW1P 4QJ (UK)
- 1973-1977 TRUHAUT, R., Prof.
Laboratoires de Toxicologie et d'Hygiène Industrielle, Faculté
des Sciences Pharmaceutiques et Biologiques de Paris Luxembourg,
Université René Descartes, 4 Avenue de l'Observatoire, F-75006
Paris Cedex 06 (France)

VI.6 COMMISSION ON TERMINAL PESTICIDE RESIDUES

(Established 1965)

Titular Members

Chairman

- 1973-1977 KEARNEY, P. C., Dr.
Pesticide Degradation Laboratory, Agricultural Environmental
Quality Institute, US Department of Agriculture, Beltsville,
Maryland 20705 (USA)
(TEL: 301-344-3533)

Secretary

- 1975-1979 GREENHALGH, R., Dr.
Environmental Chemistry Section, Chemistry and Biology
Research Institute, Canada Department of Agriculture, Ottawa,
Ontario K1A 0C6 (Canada)
(TEL: 613-994-9721)

Members

- 1971-1979 BARON, R. L., Dr.
Health Effects Research Laboratory, Environmental Toxicology
Division, US Environmental Protection Agency, Research
Triangle Park, North Carolina 27711 (USA)
- 1973-1977 CROSBY, D. G., Prof.
Department of Environmental Toxicology, University of California,
Davis, California 95616 (USA)
- 1975-1979 ENGST, R., Prof.
Zentralinstitut für Ernährung der Akademie der Wissenschaften
der DDR, Arthur-Scheunert-Allee 114-116, 1501 Bergholz-
Rehbrücke (German Democratic Republic)
- 1971-1979 GEISSBÜHLER, H., Dr.
Agrochemical Division, CIBA-GEIGY AG, CH-4002 Basel
(Switzerland)
- 1971-1979 KORTE, F., Prof.
Institut für Ökologische Chemie der Technischen Universität
München, Am Löwentor, D-8050 Freising-Weihenstephan
(Federal Republic of Germany)
- 1973-1977 MIYAMOTO, J., Dr.
Research Department, Pesticides Division, Sumitomo Chemical
Co. Ltd., 4-2-1, Takatsukasa, Takarazuka, Hyogo 665 (Japan)

Associate Members

- 1971-1977 DEKHUIJZEN, H. M., Dr.
Centrum voor Agrobiologisch Onderzoek (CABO),
Bornsesteeg 65, POB 14, Wageningen (Netherlands)
- 1971-1977 DRESCHER, N., Dr.
Landwirtschaftliche Versuchsstation, BASF Aktiengesellschaft,
Postfach 220, D-6703 Limbürghof (Federal Republic of
(Germany)

- 1973-1977 MAYR, G. E., Dr.
Deutsche Gesellschaft für Schädlingbekämpfung mbH, Neue
Mainzer Strasse 1, Postfach 2644, D-6000 Frankfurt/Main 1
(Federal Republic of Germany)
- 1975-1977 STILL, G. G., Dr.
Metabolism and Radiation Research Laboratory, State University
Station, US Department of Agriculture, Fargo, North Dakota
58102 (USA)

National Representative

- New* MASON, G. W., Dr.
Zealand Ivon Watkins-Dow Ltd., POB 144, New Plymouth
1975-1977

VI.7 COMMISSION ON PESTICIDE RESIDUE ANALYSIS

(Established 1965)

Titular Members

Chairman

- 1967-1977 FREHSE, H., Dr.
Pflanzenschutz, Anwendungstechnik, Biologische Forschung,,
Bayer AG, D-5090 Leverkusen-Bayerwerk (Federal Republic of
Germany)
(TEL: 02172-307262. TELEX: 8510881)

Secretary

- 1975-1979 EDWARDS, M. J., Mr.
Plant Protection Division, Imperial Chemical Industries Ltd.,
Jealott's Hill Research Station, Bracknell RG12 6EY, Berkshire
(UK)
(TEL: 0344-24701. TELEX: 847556)

Members

- 1973-1977 BÁTORA, V., Dr.
Výskumný Ústav Agrochemickej Technológie, CS-810 04
Bratislava-Prejmestie (Czechoslovakia)
- 1975-1979 GREVE, P. A., Dr.
Rijks Instituut voor de Volksgezondheid, Antonie van
Leeuwenhoeklaan 9, POB 1, Bilthoven (Netherlands)
- 1973-1977 HILL, K. R., Dr.
Analytical Chemistry Laboratory, Agricultural Environmental
Quality Institute, US Department of Agriculture, Beltsville,
Maryland 20705 (USA)
- 1975-1979 KLISENKO, M. A., Dr.
Department of Chemistry, All-Union Scientific Research Institute
of Hygiene and Toxicology of Pesticides, Polymers, and Plastics,
Kiev 127 (USSR)
- 1971-1977 POLEN, P. B., Dr.
Velsicol Chemical Corp., 341 E Ohio Street, Chicago, Illinois
60611 (USA)
- 1967-1977 WIDMARK, G., Prof.
Arrhenius Laboratory, Department of Analytical Chemistry,
University of Stockholm, S-104 05 Stockholm (Sweden)

Associate Members

- 1975-1979 BATES, J. A. R., Mr.
Plant Pathology Laboratory, Ministry of Agriculture, Fisheries
and Food, Hatching Green, Harpenden, Hertfordshire (UK)
- 1975-1979 GHEORGHIEV, G. K., Dr.
Institute of Nutrition, Centre of Hygiene, D Nestorov 15, Sofia
31 (Bulgaria)

- 1971-1977 GORBACH, S., Dr.
Hoechst AG, Postfach 800320, D-6230 Frankfurt/Main 80
(Federal Republic of Germany)
- 1973-1977 HEUSER, S. G., Mr.
Pest Infestation Control Laboratory, Ministry of Agriculture,
Fisheries, and Food, London Road, Slough SL3 7HH,
Buckinghamshire (UK)
- 1973-1977 RESNICK, CH., Dr.
Plant Protection Department, Ministry of Agriculture, POB
15030, Jaffa (Israel)
- 1975-1979 TAYLOR, I. S., Mr.
Regional Laboratory (Victoria), Australian Government
Analytical Laboratories, POB 2809 AA, Melbourne, Victoria
(Australia 3001)
- 1975-1979 THIER, H. P., Prof.
Institute of Food Chemistry, University of Münster, Piusallee 7,
D-4400 Münster (Federal Republic of Germany)
- 1975-1979 VITOROVIĆ, S. LJ., Dr.
Pesticide Department, University of Beograd, Zemun, Nemanjira
6, POB 127, YU-11081 Beograd (Yugoslavia)

COORDINATING COMMITTEE ON PESTICIDE CHEMISTRY

Chairman

FREHSE, H., Dr.

Pflanzenschutz, Anwendungstechnik, Biologische Forschung,
Bayer AG, D-5090 Leverkusen-Bayerwerk (Federal Republic of
Germany)

(TEL: 02172-307262. TELEX: 8510881)

Vice-Chairman

KEARNEY, P. C., Dr.

Pesticide Degradation Laboratory, Agricultural Environmental
Quality Institute, US Department of Agriculture, Beltsville,
Maryland 20705 (USA)

(TEL: 301-344-3082)

Secretary

EDWARDS, M. J., Mr.

Plant Protection Division, Imperial Chemical Industries Ltd.,
Jealott's Hill Research Station, Bracknell RG12 6EY, Berkshire
(UK)

(TEL: '0344-24701. TELEX: 847556)

Members

BÁTORA, V., Dr.

Výskumný Ústav Agrochemickej Technológie, CS-810 04
Bratislava-Prejmestie (Czechoslovakia)

GEISSBÜHLER, H., Dr.

Agrochemical Division, CIBA-GEIGY AG, CH-4002 Basel
(Switzerland)

GREENHALGH, R., Dr.

Environmental Chemistry Section, Chemistry and Biology,
Research Institute, Canada Department of Agriculture, Ottawa,
Ontario K1A 0C6 (Canada)

HILL, K. R., Dr.

Analytical Chemistry Laboratory, Agricultural Environmental
Quality Institute, US Department of Agriculture, Beltsville,
Maryland 20705 (USA)

MIYAMOTO, J., Dr.

Research Department, Pesticides Division, Sumitomo Chemical
Co. Ltd., 4-2-1, Takatsukasa, Takarazuka, Hyogo 665 (Japan)

RESNICK, CH., Dr.

Plant Protection Department, Ministry of Agriculture, POB 15030,
Jaffa (Israel)

WIDMARK, G., Prof.

Arrhenius Laboratory, Department of Analytical Chemistry,
University of Stockholm, S-104 05 Stockholm (Sweden)

VI.8 COMMISSION ON WATER QUALITY

(Established in its present form 1975)

Titular Members

Chairman

- 1975-1979 WAGNER, R., Prof.
Chemische Abteilung, Institut für Siedlungswasserbau und
Wassergütwirtschaft der Universität Stuttgart, Bandtäle 1,
D-7000 Stuttgart 80 (Büsnau) (Federal Republic of Germany)
(TEL: 0711-7845443)

Secretary

(to be appointed)

Members

- 1968-1977 FREYSCHUSS, S., Dr.
Institutet för Vatten- och Luftvårdsforskning, Hälsingegatan 43,
POB 21060, S-100 31 Stockholm (Sweden)
- 1971-1977 GRAU, P., Dr.
Katedra Technologie Vod, Vysoká Škola Chemicko-
Technologická v Praze, Suchbátarova 5, CS-166 28 Praha
6-Dejvice (Czechoslovakia)
- 1971-1977 PEARSON, E. A., Prof.
Room 635, Davis Hall, University of California, Berkeley,
California 94720 (USA)
- 1971-1977 TROBISCH, K., Dr.
Abteilung Reinhaltung Wasser und Luft, Hoechst AG, D-6230
Frankfurt/Main 80 (Federal Republic of Germany)

Associate Members

- 1972-1977 BETHGE, P. O., Dr.
Svenska Träforskningsinstitutet, Drottning Kristinas Väg 53-69,
POB 5604, S-114 86 Stockholm (Sweden)
- 1975-1979 GÖRANSSON, B., Mr.
Institutet för Vatten- och Luftvårdsforskning, Hälsingegatan 43,
POB 21060, S-100 31 Stockholm (Sweden)
- 1975-1979 QUENTIN, K. E., Prof.
Institut für Wasserchemie und Chemische Balneologie der
Technischen Universität, Marchioninstrasse 17, D-8000 München
55 (Federal Republic of Germany)
- 1971-1977 VASSEUR, E., Dr.
Statens Naturvårdsverk, S-170 11 Drottningholm (Sweden)

VI.9 COMMISSION ON RECLAMATION OF SOLID WASTES

(Established 1975)

Titular Members

Chairman

- 1975-1979 PIRT, S. J., Prof.
Department of Microbiology, Sir John Atkins Laboratories,
Queen Elizabeth College, Campden Hill, London W8 7AH (UK)
(TEL: 01-937-5411)

Secretary

- 1975-1979 POLLER, R. C., Dr.
Department of Chemistry, Queen Elizabeth College,
Campden Hill, London W8 7AH (UK)
(TEL: 01-937-5411)

Member

- 1975-1979 HUMPHREY, A. E., Prof.
107 Towne Building-D3, College of Engineering and Applied
Science, University of Pennsylvania, Philadelphia, Pennsylvania
19174 (USA)

STANDING ORDERS OF EXECUTIVE COMMITTEE REGARDING COMMITTEE ON PUBLICATIONS

Composition and Terms of Office

- (i) There shall be a standing Committee on Publications composed of a Chairman, at least three and not more than six other Members, and the Scientific Editor of the Union.
- (ii) The President in consultation with the Executive Committee shall appoint Members. The Committee on Publications may propose names of persons suitably qualified for appointment.
- (iii) The maximum period of service of ordinary Members shall be eight years, except that by special permission of the President one of the Foundation Members* may serve ten years and one for twelve years.
- (iv) In order to ensure continuity, except for the Scientific Editor, Members shall be replaced at two-year intervals, beginning in 1977, one Member at a time.
- (v) The Membership shall be reviewed every two years by the incoming President in consultation with the Executive Committee.
- (vi) The President in consultation with the Executive Committee shall appoint the Chairman. The Committee on Publications may propose candidates.
- (vii) The period of service of the Chairman shall not exceed eight years. The sum of years of service as an ordinary Member and as Chairman shall not exceed ten years.

Terms of Reference

- (i) To advise the President and the Executive Committee on all matters of publications including policy.
- (ii) To make recommendations for decision by the President and/or Executive Committee.

*Those appointed in 1969 at the establishment of the Committee.

STANDING ORDERS OF EXECUTIVE COMMITTEE REGARDING COMMITTEE ON SCOPE

Composition and Terms of Office

- (i) There shall be a standing Committee for SCOPE (ICSU Scientific Committee on Problems of the Environment) composed of a Chairman and not more than seven other Members.
- (ii) The President in consultation with the Executive Committee shall appoint Members. The Committee for SCOPE may propose names of persons suitably qualified for appointment.
- (iii) The maximum period of service of ordinary Members shall be eight years.
- (iv) The Membership shall be reviewed every two years by the incoming President in consultation with the Executive Committee.
- (v) The President in consultation with the Executive Committee shall appoint the Chairman. The Committee for SCOPE may propose candidates.
- (vi) The Chairman of the Committee for SCOPE shall be the official representative of IUPAC on SCOPE. The period of service of the Chairman shall not exceed eight years. The sum of the years of service as an ordinary Member and as Chairman shall not exceed ten years.

Terms of Reference

- (i) To advise the President and Executive Committee on the programmes and policies of SCOPE.
- (ii) Subject to the prior approval of the President and/or the Executive Committee, to carry out assignments agreed upon with SCOPE and to assist SCOPE generally in its activities.

STANDING ORDERS OF EXECUTIVE COMMITTEE REGARDING COMMITTEE ON TEACHING OF CHEMISTRY

Composition and Terms of Office

- (i) There shall be a standing Committee on Teaching of Chemistry composed of a Chairman, a Secretary, and six other Members.
- (ii) The President in consultation with the Executive Committee shall appoint Members. The Committee on Teaching of Chemistry may propose names of persons suitably qualified for appointment.
- (iii) The maximum period of service of ordinary Members shall be eight years.
- (iv) The Membership shall be reviewed every two years by the incoming President in consultation with the Executive Committee.
- (v) The President in consultation with the Executive Committee shall appoint the Chairman and the Secretary. The Committee on Teaching of Chemistry may propose candidates.
- (vi) The period of service of the Chairman and of the Secretary shall not exceed eight years. The sum of the years of service as an ordinary Member and as Chairman or Secretary shall not exceed ten years.

Terms of Reference

- (i) To advise the President and the Executive Committee on educational matters.
- (ii) To coordinate the educational interests and activities of all IUPAC bodies.
- (iii) To act as an informational and coordinating body for chemical education activities throughout the world and to establish a system of National Representatives as a channel of communication. To develop liaison with international organizations such as UNESCO and with national chemical societies or chemical education committees.

STANDING ORDERS OF EXECUTIVE COMMITTEE REGARDING COORDINATING COMMITTEE FOR ANALYTICAL METHODS FOR CEE AND IARC

Composition and Terms of Office

- (i) There shall be a standing Coordinating Committee for Analytical Methods for the Communauté Européenne Economique (CEE) and the WHO International Agency for Research on Cancer (IARC), composed of a Chairman, a Secretary, and six other Members.
- (ii) The President in consultation with the Executive Committee shall appoint Members. The Coordinating Committee may propose candidates.
- (iii) The maximum period of service of ordinary Members shall be eight years.
- (iv) The Membership shall be reviewed every two years by the incoming President in consultation with the Executive Committee.
- (v) The President in consultation with the Executive Committee shall appoint the Chairman and the Secretary. The Coordinating Committee may propose candidates.
- (vi) The period of service of the Chairman and of the Secretary shall not exceed eight years. The sum of the years of service as an ordinary Member and as Chairman or Secretary shall not exceed ten years.

Terms of Reference

- (i) On behalf of the President and the Executive Committee to fulfil the requirements of the annual contract of CEE with IUPAC for the provision of analytical methods.
- (ii) To advise the President and the Executive Committee on analytical methods in connexion with IARC.

STANDING ORDERS OF EXECUTIVE COMMITTEE REGARDING FINANCE COMMITTEE

Composition and Terms of Office

- (i) There shall be a standing Finance Committee composed of five Members and a Chairman. In addition, the Treasurer shall be an *ex officio* Member but without voting power.
- (ii) The President in consultation with the Executive Committee shall appoint Members. The Finance Committee may propose names of persons suitably qualified for appointment.
- (iii) The maximum period of service of ordinary Members shall be eight years.
- (iv) The Membership shall be reviewed every two years by the incoming President in consultation with the Executive Committee.
- (v) The President in consultation with the Executive Committee shall appoint the Chairman. The Finance Committee may propose candidates.
- (vi) The period of service of the Chairman shall not exceed eight years. The sum of the years of service as an ordinary Member and as Chairman shall not exceed ten years.

Terms of Reference

- (i) To advise the President and the Executive Committee on financial matters.
- (ii) To make recommendations for decision by the President and/or Executive Committee.
- (iii) To review the IUPAC investment portfolio at least annually and make such changes as appear appropriate.
- (iv) The Finance Committee shall not have executive functions except with respect to dealings in securities. The Finance Committee shall have executive authority with respect to selection, purchases, and sales of securities held by IUPAC, provided that the Treasurer and the IUPAC Banker concur with the decisions of the Finance Committee.

STANDING ORDERS OF EXECUTIVE COMMITTEE REGARDING INTER-DIVISIONAL COMMITTEE ON MACHINE DOCUMENTATION IN THE CHEMICAL FIELD

Composition and Terms of Office

- (i) There shall be a standing Interdivisional Committee on Machine Documentation in the Chemical Field composed of a Chairman, a Secretary, and six other Members. It shall have representatives who are directly involved in editorial programmes, especially primary and secondary publications.
- (ii) The President in consultation with the Executive Committee shall appoint Members. The Interdivisional Committee may propose names of persons suitably qualified for appointment.
- (iii) The maximum period of service of ordinary Members shall be eight years.
- (iv) The Membership shall be reviewed every two years by the incoming President in consultation with the Executive Committee.
- (v) The President in consultation with the Executive Committee shall appoint the Chairman and the Secretary. The Interdivisional Committee may propose candidates.
- (vi) The period of service of the Chairman and of the Secretary shall not exceed eight years. The sum of the years of service as an ordinary Member and as Chairman or Secretary shall not exceed ten years.

Terms of Reference

- (i) To advise the President and Executive Committee on machine documentation matters in the chemical field.
- (ii) Subject to the prior approval of the President and/or the Executive Committee, to work on methods for standardization and codification in the machine documentation field. The first task shall be directed towards the machine handling of chemical structures and the computer generation of nomenclature in consultation with the relevant IUPAC Commissions.

STANDING ORDERS OF EXECUTIVE COMMITTEE REGARDING INTER-DIVISIONAL COMMITTEE ON NOMENCLATURE AND SYMBOLS

Composition and Terms of Office

- (i) There shall be a standing Interdivisional Committee on Nomenclature and Symbols (IDCNS), composed of a Chairman, a Vice-Chairman, a Secretary, the Scientific Editor of the Union, two representatives from each Division, and one representative from the Section on Clinical Chemistry.
- (ii) The President in consultation with the Executive Committee shall appoint the representatives of the Divisions and of the Section on Clinical Chemistry. The Interdivisional Committee, Division Presidents, and President of the Section on Clinical Chemistry may propose names of persons suitably qualified for appointment.
- (iii) The period of service of representatives shall be four years, renewable for a further term of four years.
- (iv) The President in consultation with the Executive Committee shall appoint the Chairman, the Vice-Chairman, and the Secretary. The Interdivisional Committee may propose candidates.
- (v) The period of service of the Chairman, the Vice-Chairman, and the Secretary shall be four years, renewable for a further term of four years. The sum of years as a representative and as Chairman, Vice-Chairman, or Secretary shall not exceed ten years.
- (vi) The following organizations shall be invited to attend meetings of the Interdivisional Committee:

Bureau International des Poids et Mesures
International Company Associates Group
International Organization for Standardization
International Union of Biochemistry
International Union of Nutritional Science
International Union of Pure and Applied Biophysics
International Union of Pure and Applied Physics

Terms of Reference

- (i) To be responsible for submission to the Bureau/Council, in accordance with Bylaw 2.11, for publication or otherwise, any IUPAC document concerned with nomenclature and symbols.
- (ii) Before recommending any material for publication as an IUPAC document, to ensure that the fullest possible consultations have taken place, and the widest possible consensus has been reached among all Divisions, Sections, Commissions, and other bodies of the Union, and

between IUPAC and other ICSU bodies, the international standardizing organizations, and Conference Générale des Poids et Mesures (CGPM) and its Committees.

- (iii) To ensure that any considered IUPAC view shall carry the fullest possible weight among other international organizations, all negotiations on matters concerned with nomenclature and symbols with other ICSU bodies, with the international standardizing organizations, and with CGPM and its Committees, shall be conducted through the Interdivisional Committee, which shall advise the Executive Committee accordingly.
- (iv) To be responsible, after consultations with all relevant bodies of IUPAC, for the official IUPAC comments on all documents on nomenclature and symbols sent to the Union for comment.
- (v) To advise the President and Executive Committee on suitable persons for appointment as representatives of IUPAC on other bodies concerned with nomenclature and symbols.

INDEX TO MEMBERS OF IUPAC BODIES

- Abdel Kader M. M. 39
 Abou-El-Azm A. 1, 18
 Ackermann G. 86
 Adams R. M. 64
 Adlercreutz H. 36
 Ahrens L. H. 8
 Ahrland S. 96
 Albert A. 77, 78
 Alcock C. B. 61, 66
 Alkemade C. TH. J. 92
 Allen G. 82
 Amato I. 66
 Ambrose D. 42, 51, 53
 Ames S. R. 29
 Anderegg G. 96
 de Angelis G. 36
 Angus S. 45, 48
 Ansara I. 43
 Antikainen P. J. 21
 Ariëns E. J. 75, 78
 Armbrecht B. H. 38
 Armstrong G. T. 31
 Arndt R. R. 22
 Asahara T. 111, 115
 Atma Ram 67

 Baehr H. D. 48
 Bagnall K. W. 61
 Bailey W. J. 82
 Baltes W. 104
 Bamford C. H. 79
 Bankowski YU. A. 86
 Bargellini A. 22
 Barnes I. L. 62
 Baron R. L. 119
 Barrer R. M. 59
 Barrett J. W. 18, 25, 28, 32, 80, 84
 Barton A. F. M. 98
 Barton D. H. R. 1
 Bartos J. 86
 Bates J. A. R. 121
 Bates R. G. 94
 Bátora V. 121, 123
 Battino R. 96, 98
 Bayer G. D. 68
 Beare-Rogers J. 112, 115, 116
 Beck M. T. 86
 Becker E. D. 54
 Becker G. W. 82
 Beckett C. W. 45, 47
 Beckey H. D. 58
 Behrens D. 18
 Belcher R. 24, 86
 Bell A. T. 47
 Belyaev YU. I. 92
 Benoît H. 79

 Berezin I. V. 20
 Bergström-Nielsen M. 104
 Berkem A. R. 23
 Bertello L. F. 64
 Bertrán J. F. 21
 Bethge P. O. 124
 Beynon J. H. 54, 58
 Bidault J. 7
 Biemann K. 58
 Bierens de Haan J. 37
 de Bièvre P. 62
 Bikales N. M. 83
 Billek G. 104
 Birks L. S. 92
 Bishop E. 87, 94
 Björkman A. 25
 Bláha K. 19, 71
 Bliznakov G. N. 21
 den Boef G. 87
 Boekelheide V. C. 69
 Bokii G. B. 26
 Bonet C. 47
 Bourdon R. 40
 Branica M. 94
 Braunstein A. E. 30
 Breitenbach J. W. 80
 Bremer H. 21
 Breuer H. 36
 Brewer L. 45
 Brodersen S. 56
 Bronn W. K. 110
 de Bruckere L. 21
 Broughton P. M. G. 9, 35, 36
 Brouwer D. M. 69
 Brown R. D. 20
 Brown S. S. 40
 Bro-Rasmussen F. 106
 de Bruin M. 101
 Brunner E. 51, 53
 Brüscheiler H. 111, 116, 117
 Bulanin M. O. 56
 Bunnett J. F. 73
 Burger A. 77, 78
 Burwell, Jr. R. L. 59
 Buschbeck K. CH. 64
 Büttner J. 37

 Cabannes F. 67
 Cairns R. W. 1
 Calado J. C. G. 51
 Cali J. P. 51, 53
 Cameron A. E. 62
 Campaigne E. 78
 Campbell A. D. 106
 Cardoso Pereira J. L. 22
 Carola C. 111, 115, 116, 117
 Castang J. 115, 116, 117

Castle R. N. 9
 Cattaneo P. 112
 Cavalla J. F. 75, 77, 78
 Ceriotti G. 35
 Chapman O. L. 74
 Chatt J. 64
 Cheng K. L. 88
 Chisman D. G. 20, 32
 Chobanov D. 112, 115, 116
 Clary J. J. 41
 Clegg P. L. 84
 Clever H. L. 98
 Clifford A. F. 96, 98
 Coetzee J. F. 94
 Coffin D. E. 105
 Cohn W. E. 30
 Cole A. R. H. 1, 32, 56, 73
 Coles L. E. 106
 Collings A. J. 102, 106, 108
 Collongues R. 67
 Comar D. 100
 Combet-Farnoux C. 77
 Connolly J. F. 111
 Cook G. B. 100
 Cook W. B. 23
 Cornelius J. A. 111, 115
 Corradini P. 79, 83
 Cortés L. 23
 Courcelles C. 115, 117
 Covington A. K. 94
 Cox J. D. 45, 48
 Coyle T. D. 65
 Craig B. M. 113
 Crespi M. B. A. 100
 Crivelli M. A. 2
 Crosby D. G. 119
 Cross L. C. 7, 19, 71, 83
 Cullis C. F. 19, 27
 Curnow D. H. 34, 39
 Czedit-Eysenberg P. B. 112

Dahlbom R. 75
 Dancy E. A. 98
 Davídek J. 105
 Davis S. S. 98
 Defalque A. 39
 Dekhuijzen H. M. 119
 Delhay M. 56
 Dellweg H. 109
 Delvaux E. L. 111, 115, 116
 Dempsey B. 99
 Diaz-Peña M. 46
 Dieffenbacher A. 114
 Diehl P. 54
 Dixon H. B. F. 30
 Dizier J. 117
 Dodgen D. F. 104
 Dörr F. 54
 Dowden D. A. 9

Dreiding A. S. 23
 Dreschler N. 119
 Drope E. 118
 Drowart J. 67
 Dubois J. E. 26
 Durig J. R. 56
 Durst R. A. 49
 Duyckaerts G. 85, 87
 Dybkaer R. 27, 34, 38
 Dyrssen D. 90
 Edhborg A. 105
 Edsall J. T. 31
 Edwards M. J. 121, 123
 Egan H. 3, 18, 24, 28, 102
 van Eijk van Voorthuijsen J. J. B. 26
 Eliezer I. 98
 Elyashévich M. A. 32, 47, 57
 Emanuel N. M. 2
 Embree N. D. 114, 115
 Emschwiler G. 8
 Engel F. 81
 Engst R. 119
 Epelboin I. 50
 Epstein J. A. 28, 102
 Erdey-Grúz T. 50, 64
 Eroshin V. K. 109
 Ertl G. 59
 Ertola R. J. 109
 Everett D. H. 60

Fairall R. 8
 Farina M. 81
 Fassel V. A. 93
 Fauchais P. 47
 Fayard M. 42
 Fernelius W. C. 27, 61, 65
 Feuerberg H. 51, 53
 Fiat D. 9
 Fiechter A. 109
 Fink-Jensen P. H. 80, 84
 Firestone D. 111, 115, 116, 117
 Fischer W. 90
 Fitzer E. 66
 la Fleur P. 88
 Fluck E. 61, 65
 Foex M. 66
 Fontan J. 82
 Foss O. P. 36
 Fox R. B. 83
 Fransozini P. 46
 Frehse H. 102, 121, 123
 Frei J. 35, 36
 Frei K. 57
 Freiser H. 85, 90, 96
 Freyschuss S. 102, 124
 Froment M. 50
 Fugas M. 118
 Fujinaga T. 94
 Fujiwara S. 26, 62

Gallais F. 61
 Gallay W. 29, 32
 Galus Z. 94
 Gassiot-Matas M. 114
 Gauvin W. H. 47
 Gažo J. 21
 Geissbühler H. 119, 123
 Gel'man N. E. 88
 Gerrard W. 98
 Gheorghiev G. K. 121
 Ghose T. K. 109
 Gierst L. 94
 Giesbrecht E. 21
 Gilles P. W. 67
 Girardi F. 100
 Glemser O. 2
 Gold V. 73
 Gomišček S. 88
 Göransson B. 124
 Gorbach S. 122
 Gracian Tous J. 111, 115, 116
 Graham R. P. 52
 Gräsbeck R. 33, 34
 Grasserbauer M. 88
 Grau P. 124
 Graulich W. 25
 Green J. H. S. 53
 Greenhalgh R. 119, 123
 Greenwood N. N. 61, 62
 Greve P. A. 115, 121
 Grimmer G. 104
 Grimsvang T. 113
 Grünewald H. 19, 71
 Guerrero A. H. 20
 Guilbault G. G. 90
 Guillaumin R. 116
 Guillaumont R. 21
 Gullbrandson B. 112
 Gurvich L. V. 42, 45
 Gutfreund H. 31
 Guthenberg H. 105
 Gutmann V. 27, 61

Haase R. 42, 50
 Haber J. 60
 Hadni A. 54
 Hadorn H. 112
 Haenni E. O. 24, 104, 108
 Hagemann R. 63
 Hammer R. 67
 Hammond G. S. 20
 Hansen R. G. 59
 Hardy G. 81
 Hashimoto T. 113, 115, 116
 Haul R. 59
 Hautfenne A. 112, 116
 Heinze D. 80
 Hellmann H. 20
 Hendrikse P. W. 113, 115

Herington E. F. G. 53
 Herout V. 2
 Herrmann R. 38
 Heuser S. G. 122
 Heusler K. 70
 Heusler K. E. 49
 Herzberg G. 54
 Hill K. R. 103, 121, 123
 Hirayama K. 72
 Hitchings T. 22
 Hjelm M. 37
 Hlaváč J. 66
 Hofacker U. 21
 Hoffmann-Ostenhof O. 28, 30, 76
 Högfeldt E. 96, 99
 Holden N. E. 62
 Holló J. 109, 113, 115
 Holtan H. 50
 Homolka J. 35
 Hoogerheide J. C. 109
 Horecker B. L. 30
 Horn O. 1, 25
 Horton W. S. 67
 Horwitz W. 7
 Hoste J. 100
 Houlihan W. 75
 Hoytink G. J. 74
 Hulanicki A. 86
 Humber L. G. 75
 Hume D. N. 85, 97
 Humphrey A. E. 109, 125
 Hussein M. K. 67
 Huyskens P. 98

Ibl N. 49
 Illuminati G. 20
 Inczédy J. 86
 Irving H. M. N. H. 28, 90, 97
 Isler O. 2
 Itô S. 69
 Iwakura Y. 80
 Izutsu K. 95

Jackwerth E. 89
 Jacobsberg B. 112, 115, 116
 Jakoby W. B. 30
 Jakubowski A. 114, 115
 Jeannin Y. 64
 Jemmali M. 106
 Jencks W. P. 31
 Jenkins A. D. 83
 Jenkins R. 93
 Jensen K. A. 65
 Jeżowska-Trzebiatowska B. 22, 55
 Johnson A. R. 112
 Johnson W. H. 62
 Jones R. N. 2, 42, 57
 Jordan J. 94
 Jordanov N. 87
 Jørgensen K. 38
 Juhász E. 51, 53
 Justice J. C. 49

- Kabanov V. A. 79
 Kaiser E. 35
 Kaiser H. 85, 93
 Kálal J. 81
 Kalland G. 22
 Kambe H. 8
 van Kampen E. J. 35
 Kane J. G. 113
 Kane P. O. 95
 Kapel M. 86
 Kapoor R. C. 95
 Karagunis G. 21
 Karleskind A. 115, 117
 Karlson P. 30
 Karsulin M. 50
 Kasprzak K. 41
 Kauffman F. L. 105, 108
 Kazansky V. B. 59
 Kearney P. C. 119, 123
 Kehiaian H. 48
 Kelló V. 43
 Kemball C. 59
 Kemula W. 95
 Kepes A. 80
 Kertes A. S. 96, 98
 Kienitz H. 52, 53
 Kirk D. N. 19
 Kirkbright G. F. 90
 Kirschner S. 9
 Kjaer A. 69
 Klesney S. P. 28, 71
 Klikorka J. 65
 Klisenko M. A. 121
 Klyne W. 30, 71
 Kobayashi T. 75
 Koch O. G. 89
 Koefoed J. 43
 Kohler F. 46
 Kojima K. 24, 106, 108
 Kops J. 81
 Koptuyg V. A. 54
 Korte F. 119
 Kosta L. 100
 Kraft G. 95
 Krawczyński J. 36
 Krogh P. 106
 Krönert W. 107
 Kubacki S. J. 104
 Kubaschewski O. 66
 Kurucz E. 113, 115, 116, 117
 Kúta J. 49

 Laffitte M. 20, 45
 Laine B. M. 110
 Lamola A. A. 74
 Landolt D. 9
 Lane J. E. 51
 Langlykke A. F. 102, 110
 Lapworth K. C. 47
 Lacqua K. 92
 Latner A. L. 39

 Leden I. 22
 de Leenheer A. 35
 Leigh G. J. 64
 Lemmonier A. 36
 Levin Ö. 114, 115, 116, 117
 Lévy R. 89
 Lewkowitsch P. R. E. 114, 116
 Le-Van-Thoi 22
 Lide, Jr. D. R. 27, 43, 57
 Liébecq C. 30
 Lieser K. H. 101
 Lindberg J. J. 81
 Lindstedt S. 36
 Link W. E. 114, 116
 Lintz-Christensen S. B. 113, 115, 116
 Littlehailes J. D. 107
 Loening K. L. 28, 71, 83
 Lossing F. P. 58
 Louisot P. 39
 Lous P. 2, 33, 34, 39
 Lozac'h N. 27, 71
 Lucena Conde F. 87
 Lück E. 105
 Lundquist F. 37
 Lux F. 101
 Luxon S. G. 118
 Lyklema J. 59

 Macdonald R. S. 57
 Magnéli, A. 68
 Malatesta L. 2, 61
 Málek I. 109
 Mandel M. 80
 Marcus Y. 97
 Marcuse R. 24, 102, 104, 108
 de Maria G. 66
 Marini-Bettolo G. B. 76
 Marov I. N. 97
 Marsel J. 58
 Marsh K. N. 52
 Martell A. E. 97
 Martin R. L. 62
 Martinez-Moreno J. 112
 Maschka A. 20
 Mashiko Y. 52
 Mason G. W. 120
 Mathieu J. 25, 70, 76
 Matrka M. 52
 Matsumoto O. 47
 Mayr G. E. 120
 McCartney E. R. 67
 McDonald I. R. C. 105
 McGlashan M. L. 33, 43
 McGwynne B. M. 113
 McNeely M. D. D. 41
 McTaggart F. K. 47
 Meites L. 95
 Meininger J. 41
 Melhuish W. H. 92

- Menis O. 90
 Menshikov V. V. 35
 Mercier M. J. 40
 Métais P. 38
 Mii T. 67
 Milazzo G. 51, 53
 Milone M. 52
 Minč S. 50
 Mingos D. M. P. 64
 Mitchell F. L. 35
 Miyamoto J. 119, 123
 Mizuike A. 88
 Modena G. 69
 Molinari E. 47
 Möller A. T. 111, 115, 116, 117
 Monacelli R. 113, 115, 116
 Morcillo Rubio J. 22
 Morgan L. 41
 Morikawa K. 60
 Morino Y. 32, 55
 Morrison G. H. 88
 Motzfeldt K. 67
 Mrowec S. 68
 Mukai T. 74
 Mukerjee P. 60
 Mukherjee J. N. 52
 Müller R. 92
 Musso H. 69
 Muto G. 22
 Mutschler E. 75, 77, 78
 Myasoedov B. 64
 Mysels K. J. 42, 59

 Nagakura S. 2
 Nakajima A. 79
 Nancollas G. H. 96, 98
 Naudet M. 112, 115, 116, 117
 Nauta W. TH. 76, 77
 Neale F. C. 35
 Neuse E. W. 81
 Newbold B. T. 21
 Newton A. 52, 53
 Niewiadomski H. 114
 Niki K. 50
 Nikonorow M. 104
 Niño L. C. 21
 Nitya Anand 76
 Nixon J. C. 35
 Noirfalise A. 40
 Nomoto S. 41
 Norseth T. 41
 Nowotny H. 67
 Nürnberg H. W. 94

 Ohlson R. 114, 115, 116, 117
 Ohno K. 106, 108
 Ohse R. W. 67
 Ohtaki H. 97, 99
 Okamura S. 81
 van Olphen H. 60

 Orekhovich V.M. 36
 den Os D. P. 22
 Osman A. M. 74
 Ourisson G. 1, 19
 Overberger C. G. 3, 18, 79

 Pais I. 21
 Panayotov I. M. 80
 Parisi F. 32, 110
 Parker R. E. 7
 Paquot C. 111, 115, 116
 Parsons R. 49
 Pattinson M. E. 113
 Paul M. A. 27, 43
 Pearson E. A. 124
 Peiser H. S. 63
 Pellerin F. 24
 Peng Yu-Tsai 22
 Penton J. R. 73
 Pepper D. C. 81
 Perez-Masiá A. 2, 19, 43
 Perone S. P. 91
 Perrin D. D. 95, 96, 99
 Pesetz M. 87
 Petersen A. 112, 116
 Philipp B. 81
 Pietsch H. 8
 Pilz W. 118
 Pínta M. 88
 Pirt S. J. 110, 125
 Platé N. A. 83
 Plebanski T. 51, 53
 Plško E. 92
 Pokorný J. 113, 115, 116
 Polak L. S. 47
 Polen P. B. 121
 Poller R. C. 125
 Porter C. J. 39
 Powell W. H. 64, 72
 Pratesi P. 77
 Preisich M. 8
 Prevot A. 115, 116, 117
 Privalov P. 31
 Protiva M. 75
 Pungor E. 85, 95
 Purdy W. C. 35

 Quentin K. E. 124
 Quinkert G. 74

 Rachlin A. I. 75
 Rafter T. A. 100
 Ralph B. P. 110
 Rånby B. 82
 Rangaswami S. 2
 Ranke-Madsen E. 21
 Raphael R. A. 69
 Rao C. N. R. 20, 55
 Rätzsch M. 46

Reidinger F. J. 86
 Resnick CH. 122, 123
 Reymond D. 102
 Reynolds D. C. 113, 116
 Rice N. M. 90
 Rieck G. D. 66
 Riess J. 65
 Rigaudy J. 28, 71
 Rigg J. C. 38
 Righelato R. C. 109
 Ring W. 28, 83
 Ringelhann B. 36
 Ristić M. 68
 Roberts M. W. 59
 Robertson A. J. B. 90
 Robin J. P. 92
 Robinson M. D. 23
 Rogers L. B. 91
 Rossiter B. W. 18, 25
 Roth E. 58, 62
 Roth M. 34, 39
 Rowlinson J. S. 48
 Rubeška I. 93
 Rubin M. 39
 Rüchardt CH. 73
 Ruis-Miró A. 50
 Rutkowski A. 105, 112, 115, 116, 117

Sadek H. 20
 Saëki S. 52
 Sahagún A. B. 22
 Saito K. 65
 Saito N. 63, 100
 Samuel D. 22
 Samuelson O. 28
 de Sanchez M. L. C. 36
 Sandorfy C. 54
 Sanfeld A. 49
 Sang Up Choi 22
 Sankar Das 100
 Sarel S. 75, 78
 Saunders J. H. 80
 Savory J. 40
 Savvin S. B. 85, 87
 Schäffer C. 65
 Schaffner K. 7, 74
 Schatz B. A. 104, 108
 Schenk H. R. 26
 Scheraga H. A. 82
 Schieber M. 9
 Schirmer W. 60
 Schneider G. M. 45
 Schuijff A. 43
 Schuller P. L. 24, 106
 Schulz R. C. 79
 Schutte C. J. H. 56
 Schwartz M. K. 36, 39
 Sensi P. 78
 Serjeant P. 99

Sersale R. 68
 Sheppard A. J. 115
 Sheppard N. 32, 42
 Shimanouchi T. 54, 57
 Shorland F. B. 113
 Siggaard-Andersen O. 38
 Siggia S. 86
 Sigwalt P. 81, 83
 Sigworth G. K. 98
 Silberberg A. 81
 Simionescu C. I. 22, 82
 Simonsgaard V. 28
 Slover H. T. 115
 Smales A. A. 100
 Smets G. 1
 Smith A. L. 56
 Sokolovskaya E. M. 23
 Solomon D. H. 80
 Songina O. A. 95
 Spiegel H. E. 40
 Stamm D. 35
 Start P. A. 22
 Stary J. 96
 Strasheim A. 92
 Steele B. C. H. 66
 Steinnes E. 101
 Stephen W. I. 87
 Steyn P. S. 107
 Still G. G. 120
 Stoeppler M. 41
 Stoll W. G. 102
 Streitwieser, Jr. A. 73
 Subba Rao N. V. 21
 Suhr C. 26
 Suhr H. 47
 Sukh Dev 70
 Sunderman, Jr. F. W. 34, 40
 Sunner S. 42
 Suomalainen H. 2, 102
 Suschny O. 52
 Svehla G. 90
 Sytchev V. V. 48
 Szabo E. 101

Takahashi G. 110
 Takahashi Y. 45
 Tal'rose V. I. 58
 Tamamushi R. 50
 Tanaka N. 3, 85, 95
 Tanida H. 70
 Tate F. A. 26
 Tatematsu A. 58
 Tawfik H. A. 91
 Taylor I. S. 122
 Terent'eva E. A. 88
 Terminassian-Saraga L. 60
 Terrien J. 28, 44, 51
 Teupel M. 113, 116, 117
 Teyssié PH. 80

- Thier H. P. 122
 Thode H. G. 62
 Thompson H. W. 1, 32, 55
 Thuillier J. 75
 Tiscornia E. 113
 Toldy L. 76
 Tölg G. 88, 91
 Tomko J. 69
 Tomlinson J. W. 50
 Tonks D. B. 34, 40, 103
 Toullec J. 73
 Townshend A. 89, 91
 Tracey M. V. 106
 Trasatti S. 49
 Trémillon B. 95
 Tretiakov I. I. 60
 Trobisch K. 124
 Truhaut R. 24, 107, 118
 Tsuruta T. 83
 Tüdös F. 79
 Tuinstra L. G. M. TH. 115
 Turner D. W. 54, 74
 Turska E. 81
- Ugelstad J. 81
- Vakula V. L. 80
 Vallet G. 8
 Vanderzee C. E. 46
 Vas K. 105
 Vasseur E. 124
 Veal D. C. 26
 Villena L. 29
 Vitorovič D. 20
 Vitorović S. LJ. 122
 Vlček A. A. 61, 65
 Vögtle F. 72
 Vos H. J. 111, 115, 116, 117
 de Vos R. H. 115
 de Vries A. J. 79
- Waddington G. 42
 Wadsö I. 31, 45
 Wagner R. 124
 Wainerdi R. E. 100
 Walker E. A. 105
 Wapstra A. H. 62
 Wasserman A. E. 104, 108
- Webb E. C. 30
 van der Weel J. C. 111, 116, 117
 Weil K. G. 43
 Weisz H. 86
 Weller A. 74
 Wendt H. H. R. H. 113, 116
 Wessels H. 112, 116
 West T. S. 33, 85, 91
 Westrum, Jr. E. F. 42, 45, 99
 Whalley E. 46
 Whiffen D. H. 27, 32, 43
 White, Jr. H. J. 48
 White J. C. 85
 Whitehead T. P. 34, 37
 Wichterle O. 80
 Widmark G. 121, 123
 Wilhelm E. 98
 Williams K. A. 114, 115, 116, 117
 Williamson A. G. 46
 Willis H. A. 55
 Wilski H. 83, 84
 Winefordner J. D. 92
 Winslow F. H. 79
 Wolff J. P. 112, 115, 116
 Wolfram E. 60
 Worrell W. 68
 Worsaae U. 35
 Wighton M. 74
 Wutzel H. 110
- Yamada K. 109
 Yamamura Y. 36
 Yamasaki K. 65
 Yates P. 69
 Yatzimirskii K. B. 61, 99
 Yeager E. 49
 Young C. L. 97, 98
 Young D. S. 34, 37
- Zachariasen H. 41
 Zaikov G. E. 25
 Zander M. 93
 Zender R. 34, 38
 Zerbi G. 54
 Zettler H. 90
 Ziebland H. 53
 Ziegler H. J. 72
 Zielenkiewicz W. 46
 Zollinger H. 2, 18, 69, 73
 Zolotov YU. A. 89
 Zuman P. 94
 Zwobada F. 115, 116, 117

New from IUPAC



RULES FOR THE NOMENCLATURE OF ORGANIC CHEMISTRY (SECTION E: STEREOCHEMISTRY)

Collated by **L.C. CROSS**, *The Chemical Society, London* and **W. KLYNE**, *Westfield College, London*

Contents: Types of Isomerism. *Cis-trans* Isomerism. Fused Rings. Chirality. Conformations. Stereoformulae. Configuration and Conformation. Outline of the Sequence-rule Procedure.

Of interest to: Graduate and research workers in organic chemistry

ISBN 0 08 021019 8 \$6.00 £3.00
272 x 187mm

Published in **Pure & Applied Chemistry**, Volume 45, No. 1, and supplied to subscribers as part of their subscription.

THE EFFECT OF MOLECULAR ORIENTATION ON THE MECHANICAL PROPERTIES OF POLYSTYRENE

A report of the IUPAC Working Party on "Structure and Properties of Commercial Polymers" prepared by **T.T. JONES**, *Monsanto Ltd., Newport, U.K.*

Contents: Characterization of the Raw Materials. Preparation of Oriented Sheet Materials. Degree of Orientation. Some Properties of the Oriented Sheets. Summary and Conclusions.

Of interest to: Graduate and research workers in polymer chemistry

ISBN 0 08 021018 X \$6.00 £3.00
272 x 187mm

Published in **Pure & Applied Chemistry**, Volume 45, No. 1, and supplied to subscribers as part of their subscription.

RECOMMENDED REFERENCE MATERIALS FOR REALIZATION OF PHYSICOCHEMICAL PROPERTIES (SECTION: DENSITY)

Edited by **E.F.G. HERINGTON**, *East Molesley, Surrey, U.K.*

Collated by **I. BROWN** and **J.E. LANE**, *CSIRO, Melbourne, Australia*

Contents: Nomenclature and Units. Methods of Measurement. Water as a Reference Material. Mercury as a Reference Material. Other Reference Materials. Reference Materials for Density Measurement.

Of interest to: Graduate and research workers in physical chemistry

ISBN 0 08 021017 1 \$6.00 £3.00
272 x 187mm

Published in **Pure & Applied Chemistry**, Volume 45, No. 1, and supplied to subscribers as part of their subscription.

Pergamon Press

Headington Hill Hall, Oxford OX3 0BW, England
Fairview Park, Elmsford, New York 10523, USA

Educational Technology in the Teaching of Chemistry

In the last 10–15 years, audio-visual and electronic teaching aids have become increasingly important tools in science education, supplementing and complementing the teacher. While some of the gadgets now being used will fade with experience, others will develop extensively in the years ahead as truly useful tools.

The International Union of Pure and Applied Chemistry, through its Committee on Teaching of Chemistry (and with the assistance of UNESCO) organized a Symposium on this topical subject in Madrid during 6–7 September 1975. A number of distinguished chemical educators from all over the world with expertise on educational technology as applied to teaching of chemistry presented lectures which are published in the present volume. Chemical education reports from the National Representatives of many countries are also included.

Contents:

Enhanced Potentialities of New Educational Technology — **C. N. R. Rao** (India).
Developments in the Tools of Educational Technology in Chemical Education During the Last Decade — **W. T. Lippincott** (USA).
Educational and Other Factors Affecting the Selection of Techniques for Effective Teaching — **M. J. Frazer** (UK).
Mass Media and Chemical Education — **L. J. Haynes** (UK).
Effectiveness of Tools of Modern Educational Technology in the Teaching of Chemistry in the Classroom and Laboratory — **I. V. Berezin** (USSR).
Programmed Learning in Chemistry: Where do Computers Come in? — **Jay A. Young** (USA).
Computer-Assisted Instruction in Chemical Education — **A. Kornhauser** (Yugoslavia).
Educational Technology in Developing Countries — Problems and Challenges — **R. C. Mehrotra** (India).
Educational Technology in Developing Countries — Problems and Challenges — **Ariel H. Guerrero** (Argentina).
International Cooperation in Educational Technology — **C. N. R. Rao** (India).
Summary and Perspectives — **Robert C. Brasted** (USA).
Editor: **C. N. R. Rao**. viii + 225 pp. ISBN 0 9501204 4 8. Price US-\$5.00, £2.00 (inclusive of packing and postage by surface mail) and US-\$7.50/£3.00 (inclusive of postage by air). **Orders to:** IUPAC Secretariat, Bank Court Chambers, 2-3 Pound Way, Cowley Centre, Oxford OX4 3YF, UK. Dispatch of publication is expedited if remittance is enclosed with order.



IUPAC

IUPAC

INTERNATIONAL UNION OF PURE AND APPLIED CHEMISTRY



COMPTES RENDUS

28th CONFERENCE

— PART B

MADRID

2—11 September 1975

PERGAMON PRESS

IUPAC SECRETARIAT

*

Bank Court Chambers
2-3 Pound Way
Cowley Centre
Oxford
OX4 3YF
UK

*

Telephone
Oxford
770125 & 772834

*

Telegrams
IUPAC OXFORD

*

Executive Secretary
M. WILLIAMS
B.Sc., Ph.D., F.R.I.C.

*

Assistant Secretary
(Administration)
ANN TROUGHTON

*

Assistant Secretary
(Publications)
P. D. GUJRAL
B.Sc., M.Sc.

ISBN: 0 08 021357 X

COMPTES RENDUS

28th CONFERENCE

IUPAC

INTERNATIONAL UNION OF PURE AND APPLIED CHEMISTRY



COMPTES RENDUS

28th CONFERENCE

— PART B

MADRID

2—11 September 1975



PERGAMON PRESS

OXFORD · NEW YORK · TORONTO · SYDNEY · PARIS · FRANKFURT

U.K.	Pergamon Press Ltd., Headington Hill Hall, Oxford OX3 0BW, England
U.S.A.	Pergamon Press Inc., Maxwell House, Fairview Park, Elmsford, New York 10523, U.S.A.
CANADA	Pergamon of Canada Ltd., 75 The East Mall, Toronto, Ontario, Canada
AUSTRALIA	Pergamon Press (Aust.) Pty. Ltd., 19a Boundary Street, Rushcutters Bay, N.S.W. 2011, Australia
FRANCE	Pergamon Press SARL, 24 rue des Ecoles, 75240 Paris, Cedex 05, France
WEST GERMANY	Pergamon Press GmbH, 6242 Kronberg-Taunus, Pferdstasse 1, Frankfurt-am-Main, West Germany

Published by Pergamon Press on behalf of the
International Union of Pure and Applied Chemistry

Copyright © 1977 International Union of Pure and Applied Chemistry

All Rights Reserved. No part of this publication may be reproduced, stored in a retrieval system or transmitted in any form or by any means: electronic, electrostatic, magnetic tape, mechanical, photocopying, recording or otherwise, without permission in writing from the copyright holders.

Printed in Great Britain by Express Litho Service (Oxford)

ISBN: 0 08 021357 X

B. 28th IUPAC CONFERENCE

TABLE OF CONTENTS

	Page
Official Delegates of National Adhering Organizations and Associated Organizations at 28th Conference (Council Meeting)	1
Agenda for 28th Council Meeting	12
Report of President on State of the Union	13
Biennial Report of Treasurer for 1973-4	25
Income of IUPAC from National Adhering Organizations and Company Associates in 1974	28
Auditors' Report on Accounts	29
Report of Finance Committee	32
Report of Physical Chemistry Division	34
Report of Inorganic Chemistry Division	41
Report of Organic Chemistry Division	46
Report of Macromolecular Division	50
Report of Analytical Chemistry Division	55
Report of Applied Chemistry Division	60
Report of Clinical Chemistry Section	66
Report of Committee on Teaching of Chemistry	72
Report of Committee on Publications	75
Minutes of 28th Council Meeting	76
Committee on Publications	98
Coordinating Committee for Analytical Methods for CEE and IARC	106
Finance Committee	111
Interdivisional Committee on Machine Documentation in the Chemical Field	115
Committee on Teaching of Chemistry	121
Interdivisional Committee on Nomenclature and Symbols	127
Section on Clinical Chemistry	130
Commission on Automation	136
Commission on Quantities and Units	137
Commission on Teaching	147
Commission on Toxicology	149
Physical Chemistry Division Committee	155
Commission on Physicochemical Symbols, Terminology, and Units . .	160
Commission on Thermodynamics and Thermochemistry	162
Sub-Commission on Thermodynamic Tables	177

Commission on Electrochemistry	183
Commission on Physicochemical Measurements and Standards	187
Sub-Commission on Calibration and Test Materials	191
Commission on Molecular Structure and Spectroscopy	193
Commission on Colloid and Surface Chemistry	196
Inorganic Chemistry Division Committee	205
Commission on Atomic Weights	210
Commission on High Temperatures and Refractory Materials	213
Organic Chemistry Division Committee	218
Commission on Organic Photochemistry	224
Section on Medicinal Chemistry	227
Macromolecular Division Committee	234
Commission on Macromolecular Nomenclature	239
Analytical Chemistry Division Committee	243
Commission on Analytical Reactions and Reagents	249
Commission on Microchemical Techniques and Trace Analysis	253
Commission on Analytical Nomenclature	256
Commission on Spectrochemical and Other Optical Procedures for Analysis	260
Commission on Electroanalytical Chemistry	265
Commission on Equilibrium Data	269
Subcommission on Solubility Data	274
Commission on Analytical Radiochemistry and Nuclear Materials	286
Applied Chemistry Division Committee	293
Joint Meeting of Applied Chemistry Division Committee and Chair- men and Secretaries of Sections and Commissions	297
Joint Meeting of Division Committees of Analytical Chemistry Division and Applied Chemistry Division	299
Section on Food	301
Joint Meeting of Sections on Food and on Oils and Fats	309
Commission on Food Additives	311
Commission on Food Contaminants	314
Section on Fermentation	321
Section on Oils and Fats	326
Section on Pesticides	331
Commission on Terminal Pesticide Residues	335
Commission on Pesticide Residue Analysis	388

Section on Water Quality	425
Joint Meeting of Sections on Water Quality and Fermentation Industries	427
Open Meeting of Applied Chemistry Division	428
List of Abbreviations	431

OFFICIAL DELEGATES OF NATIONAL ADHERING ORGANIZATIONS AT 28th CONFERENCE (COUNCIL MEETING)*

Arab Republic of Egypt (2)

Prof. A. ABOU-EL-AZM, Academy of Scientific Research and Technology, 101 Kasr El Eini Street, Cairo (Arab Republic of Egypt) (Leader of Delegation)

Prof. M. KAMEL MAHMOUD, National Research Centre, El-Tahir Street, Dokki, Cairo (Arab Republic of Egypt)

Secretary to Delegation:

Prof. M. M. ABDEL KADER, Department of Biochemistry, Faculty of Medicine, University of Cairo, Cairo (Arab Republic of Egypt)

Argentina (4)

Prof. A. H. GUERRERO, Biophysics Research Institute, Viamonte 1634, Buenos Aires (Argentina)

Australia (4)

Prof. A. R. H. COLE, School of Chemistry, University of Western Australia, Nedlands, Western Australia (Australia 6009) (Leader of Delegation) (also Bureau Member)

Dr. S. D. HAMANN, Division of Applied Chemistry, Commonwealth Scientific and Industrial Research Organization, POB 4331, Melbourne, Victoria (Australia 3001)

Dr. J. E. LANE, Division of Applied Chemistry, Commonwealth Scientific and Industrial Research Organization, POB 4331, Melbourne, Victoria (Australia 3001)

Dr. C. L. YOUNG, Department of Chemistry, University of Melbourne, Parkville, Victoria (Australia 3052)

Austria (2)

Prof. V. GUTMANN, Institut für Anorganische Chemie der Technischen Hochschule Wien, Getreidemarkt 9, A-1060 Wien (Austria) (also Bureau Member, President of IUPAC Inorganic Chemistry Division)

*Unless he is also an Official Delegate from a National Adhering Organization, a Bureau Member is not entitled to vote at a meeting of Council. A Secretary to a delegation is not entitled to vote.

Belgium (4)

- Prof. A. BRUYLANTS, Académie Royale de Belgique, c/o Laboratoire de Chimie Générale et Organique, Université de Louvain, **Bâtiment Lavoisier**, Place Louis Pasteur 1, B-1348 Louvain-la-Neuve (Belgium)
- Dr. M. VAN RYSSELBERGE, Comité National Belge de Chimie, c/o LABORELEC, B-1640 Rhode-St-Genèse (Belgium)
- Prof. G. SMETS, Laboratorium voor Macromoleculaire en Organische Scheikunde, Universiteit te Leuven, Celestijnenlaan 200F, B-3030 Heverlee (Belgium) (also Bureau Member)

Brazil (2)

Bulgaria (2)

- Prof. S. G. CHRISTOV, Institute of Physical Chemistry, Bulgarian Academy of Sciences, Sofia 13 (Bulgaria)

Canada (6)

- Dr. H. B. MARSHALL, Central Research Laboratory, Domtar Ltd., Senneville, Quebec H9X 3L7 (Canada) (Leader of Delegation)
- Dr. W. GALLAY, 490 Cloverdale Road, Ottawa, Ontario K1M 0Y6 (Canada) (also Bureau Member, Secretary General of IUPAC)
- Dr. R. N. JONES, Division of Chemistry, National Research Council of Canada, Ottawa, Ontario K1A 0R6 (Canada) (also Bureau Member, President of IUPAC Physical Chemistry Division)
- Mr. T. H. G. MICHAEL, Chemical Institute of Canada, Ste. 906, 151 Slater, Ottawa, Ontario K1P 5H3 (Canada)
- Dr. D. B. TONKS, Division of Clinical Chemistry, Montreal General Hospital, 1650 Cedar Avenue, Montreal, Quebec H3G 1A4 (Canada) (also Bureau Member, Chairman of IUPAC Section on Clinical Chemistry)
- Prof. P. YATES, Department of Chemistry, University of Toronto, Toronto, Ontario M5S 1A1 (Canada) / Dr. J. W. T. SPINKS, 174 Thorvaldson Building, University of Saskatchewan, Saskatoon, Saskatchewan S7N 0W0 (Canada)

Chile (1)

Columbia (2)

Cuba (1)

Czechoslovakia (4)

- Prof. V. HEROUT, Institute of Organic Chemistry and Biochemistry, Československá Akademie Věd, Flemingovo Náměstí 2, CS-166 10 Praha 6 Dejvice (Czechoslovakia) (Leader of Delegation) (also Bureau Member)
- Prof. J. GAŽO, Institute of Inorganic Chemistry, Chem. Techn. Fakulta, Slovenská Vysoká Škola Techniká, Jánska 1, CS-800 00 Bratislava (Czechoslovakia)
- Acad. V. KELLÖ, Slovak Academy of Sciences, Obráncov Mieru 41 CS-800 00 Bratislava (Czechoslovakia)
- Prof. A. A. VLČEK, Ústav Fyzikální Chemie e Elektrochemie J Heyrovského, Československá Akademie Věd, Vlašská 9, CS-118 40 Praha 1 – Malá Strana (Czechoslovakia)

Denmark (4)

- Prof. K. A. JENSEN, Kemisk Laboratorium II, H C Ørsted Institutet, Universitetsparken 5, DK-2100 København Ø (Denmark)
- Prof. S. Veibel, Organisk-Kemisk Laboratorium, Danmarks Tekniske Højskole, Bygning 201, DK-2800 Lyngby (Denmark)

Federal Republic of Germany (6)

- Dr. D. BEHRENS, DECHEMA-Sekretariat, Theodor-Heuss-Allee 25, Postfach 970146, D-6000 Frankfurt/Main 97 (Federal Republic of Germany)
- Prof. O. GLEMSER, Anorganisch-Chemisches Institut der Universität Göttingen, Tammannstrasse 4, D-3400 Göttingen-Weende (Federal Republic of Germany)
- Bureau Member:
- Prof. O. HORN (Treasurer of IUPAC), Farbwerke Hoechst AG, Postfach 800320, D-6230 Frankfurt/Main 80 (Federal Republic of Germany)

Finland (4)

- Dr. J. LARINKARI, Kemian Keskusliitto, POB 28, SF-00131 Helsinki 13 (Finland)
- Prof. H. SUOMALAINEN, Finnish State Alcohol Monopoly (Alko), POB 350, SF-00101 Helsinki 10 (Finland) (also Bureau Member)

France (6)

- Prof. G. CHAMPETIER, École Supérieure de Physique et de Chimie

Industrielles de la Ville de Paris, 10 Rue Vauquelin, F-75231 Paris Cedex 05 (France) (Leader of Delegation)

Prof. H. BENOÎT, Centre de Recherches sur les Macromolécules du Centre National de la Recherche Scientifique, 6 Rue Boussingault, F-67083 Strasbourg Cedex (France) (also Bureau Member, President of IUPAC Macromolecular Division)

Mr. J. BROCARD, 1 Rue Pasteur, F-92380 Garches (France)

Prof. F. GALLAIS, Laboratoire de Chimie de Coordination, Centre National de la Recherche Scientifique, BP 4142, F-31030 Toulouse Cedex (France)

Prof. J. MATHIEU, Centre de Recherches, Roussel Uclaf SA, 102 Route de Noisy, F-93230 Romainville (France)

Prof. C. QUIVORON, Laboratoire de Physico-chimie de Macromoléculaire, École Supérieure de Physique et de Chimie Industrielles de la Ville de Paris, 10 Rue Vauquelin, F-75231 Paris Cedex 05 (France)

Bureau Members:

Prof. J. BÉNARD (Past-President of IUPAC), École Nationale Supérieure de Chimie, Université de Paris VI, 11 Rue Pierre et Marie Curie, F-75231 Paris Cedex 05 (France)

Prof. G. OURISSON, Institut de Chimie, Université Louis Pasteur Strasbourg, BP 296/R 8, 1 Rue Blaise Pascal, F-67008 Strasbourg (France)

Prof. R. TRUHAUT, Laboratoire de Toxicologie et d'Hygiène Industrielle, Faculté des Sciences Pharmaceutiques et Biologiques de Paris Luxembourg, Université René Descartes, 4 Avenue de l'Observatoire, F-75006 Paris Cedex 06 (France)

German Democratic Republic (4)

Prof. W. SCHIRMER, Zentralinstitut für Physikalische Chemie der Akademie der Wissenschaften der DDR, Rudower Chaussee 5, 1199 Berlin (German Democratic Republic) (Leader of Delegation)

Prof. H. I. BITTRICH, Technische Hochschule "Carl Schlorlemmer", Geusaer Strasse, 42 Merseburg (German Democratic Republic)

Prof. H. Pietsch, c/o Chemische Gesellschaft der DDR, Friedrichshagenstrasse 9, 117 Berlin (German Democratic Republic)

Greece (1)

Prof. I. DILARIS, Association of Greek Chemists, 27 Kanigos Street, Athens 147 (Greece)

Hungary (4)

Prof. G. SCHAY, Central Research Institute for Chemistry, Hungarian Academy of Sciences, Pusztaszeri Út 57-69, H-1025 Budapest II (Hungary)

India (4)

Prof. R. C. MEHROTRA, University of Delhi, Delhi-7 (India) (Leader of Delegation)

Prof. S. RANGASWAMI, Department of Chemistry, University of Delhi, Delhi-7 (India) (also Bureau Member)

Prof. C. N. R. RAO, Department of Chemistry, Indian Institute of Technology, Kanpur 208016, Uttar Pradesh (India)

Ireland (1)

Prof. P. S. O'COLLA, Department of Chemistry, University College, Galway (Ireland)

Israel (4)

Dr. Ch. RESNICK, Plant Protection Department, Ministry of Agriculture, POB 15030, Jaffa (Israel) (Leader of Delegation)

Prof. A. S. KERTES, Institute of Chemistry, Hebrew University of Jerusalem, Jerusalem (Israel)

Italy (6)

Prof. L. MALATESTA, Istituto di Chimica Generale dell'Università di Milano, Via G. Venezian 21, I-20133 Milano (Italy)

Prof. G. MILAZZO, Laboratorio di Chimica, Istituto Superiore di Sanità, Viale Regina Elena 299, I-00161 Roma (Italy)

Japan (6)

Prof. T. ASAHARA, Faculty of Engineering, University of Tokyo, 3-1 Hongo 7-chome, Bunkyo-ku, Tokyo 113 (Japan)

Dr. K. HOSHINO, Toray Industries Inc., 2 Nihonbashi-Muromachi 2-chome, Chuo-ku, Tokyo 103 (Japan)

Prof. S. NAGAKURA, Institute for Solid State Physics, University of Tokyo, Azabu, Minato-ku, Tokyo (Japan)

Prof. S. SHIBATA, Faculty of Pharmaceutical Sciences, University of Tokyo,
3-1 Hongo 7-chome, Bunkyo-ku, Tokyo 113 (Japan) (also Bureau Member)
Prof. N. TANAKA, Department of Chemistry, Faculty of Science, Tohoku
University, Aza Aoba, Aramaki, Sendai 980 (Japan) (also Bureau Member,
President of IUPAC Analytical Chemistry Division)
Mr. K. YOSHIOKA, Science Council of Japan, 22-34 Roppongi 7-chome,
Minato-ku, Tokyo 106 (Japan)

Mexico (4)

Netherlands (4)

Prof. M. MANDEL, Gorlaeus Laboratoria der Rijksuniversitet, Wassenaarsweg
POB 75, Leiden (Netherlands)
Dr. D. P. DEN OS, Koninklijke Nederlandse Chemische Vereniging, Burnier-
straat 1, POB 1766, NL-2077 's Gravenhage (Netherlands)

New Zealand (4)

Dr. T. A. RAFTER, Institute of Nuclear Sciences, Department of Scientific
and Industrial Research, Private Bag, Lower Hutt (New Zealand)

Nigeria (1)

Norway (4)

Poland (4)

Prof. A. BIELÁŃSKI, Instytut Chemii, Uniwersytet Jagiellonski, Ul.
Krupnicza 41, PL 30-060 Kraków (Poland)
Prof. B. JEŻOWSKA-TRZEBIATOWSKA, Instytut Chemii, Uniwersytet
Wrocławski, Ul. Joliot-Curie 14, Wrocław (Poland)
Prof. J. MICHAŁSKI, Centrum Badań Molekularnych i Makromolekular-
nych, Polska Akademii Nauk, Ul. Predzalnicza 72, PL 90-338 Łódź

Portugal (2)

Republic of China (4)

Dr. S. F. TUNG, China Petrochemical Development Corpn., 7 Roosevelt
Road, Section 1, Taipei, Taiwan (Republic of China) (Leader of
Delegation)
Prof. C. CHEN, Chung Cheng Institute of Science and Technology, Chungli,
Taiwan (Republic of China)

Dr. P. L. C. HAO, Chinese Chemical Society, POB 609, Taipei, Taiwan
(Republic of China)

Prof. WEI-CHUWAN LIN, School of Science, National Taiwan University,
Taipei, Taiwan (Republic of China)

Republic of Korea (2)

Prof. SANG UP CHOI, Sogang University, CPO 1142, Seoul (Republic of
Korea)

Prof. TAI WON PARK, College of Engineering, Seoul National University,
Seoul (Republic of Korea)

Republic of South Africa (4)

Prof. C. J. H. SCHUTTE, Department of Chemistry, University of South
Africa, POB 392, Pretoria 0001 (Republic of South Africa) (Leader
of Delegation)

Dr. P. S. STEYN, National Chemical Research Laboratory, Council for
Scientific and Industrial Research, POB 395, Pretoria 0001 (Republic
of South Africa)

Republic of Vietnam (2)

Romania (4)

Prof. C. DRAGULESCU, Bazei de Cercetări Stintifice a Akademiei Repub-
licii Socialist România, Bulevardul Mihai Viteazul Nr. 24, Timșoara
(Romania)

Prof. C. SIMIONESCU, Akademia Republicii Socialiste România, Str. Univer-
sitatii Nr. 16, Iași (Romania)

Spain (4)

Prof. A. PEREZ-MASIÁ, Instituto de Química Física 'Rocasolano'. Consejo
Superior de Investigaciones Científicas, Serrano 119, Madrid-6 (Spain)
(Leader of Delegation)

Prof. M. COLOMINA-BARBERA, Instituto de Química Física 'Rocasolano',
Consejo Superior de Investigaciones Científicas, Serrano 119, Madrid-6
(Spain)

Prof. M. BALLESTER-BOIX, Instituto de Química, Consejo Superior de
Investigaciones Científicas, Jorge Girona Salgado s/n Zona Universitana,
Barcelona (Spain)

Prof. R. MADROÑERO-PELAEZ, Centro Nacional de Química Orgánica, Consejo Superior de Investigaciones Científicas, Juan de la Cierva 3, Madrid-6 (Spain)

Sweden (6)

Prof. S. CLAEISSON, Fysikalisk-Kemisk Institutionen, Uppsala Universitet, POB 532, S-751 21 Uppsala 1 (Sweden) (Leader of Delegation)

Dr. S. AHRLAND, Department of Inorganic and Physical Chemistry, Chemical Center, University of Lund, POB 740, S-220 07 Lund (Sweden)

Dr. H. GUTHENBERG, Swedish Customs, Fack, S-103 10 Stockholm 2 (Sweden)

Prof. G. JOHANSSON, Department of Analytical Chemistry, Umeå University, S-901 87 Umeå (Sweden)

Dr. R. MARCUSE, Svenska Institutet för Konserveringsforskning, Kallëback, Fack, S-400 21 Göteborg 16 (Sweden)

Switzerland (6)

Prof. H. SCHMID, Organisch-Chemisches Institut des Universität Zürich, Rämistrasse 76, CH-8001 Zürich (Switzerland) (Leader of Delegation)

Dr. O. ISLER, F. Hoffmann-La Roche & Co. AG, Grenzacherstrasse 124, CH-4002 Basel (Switzerland) (also Bureau Member)

Dr. M. LÜTHI, Association Suisse des Chimistes, Alpenstrasse 20, CH-3400 Burgdorf (Switzerland)

Dr. M. ROTH, Laboratoire Central, Hôpital Cantonal, CH-1211 Genève 4 (Switzerland)

Dr. W. G. STOLL, CIBA-GEIGY AG, CH-4002 Basel (Switzerland)

Prof. H. ZOLLINGER, Technisch-Chemisches Laboratorium der Eidgenössischen Technischen Hochschule, Universitätstrasse 6, CH-8006 Zürich (Switzerland)

Turkey (1)

Union of Soviet Socialist Republics (6)

Prof. N. M. EMANUEL, Institute of Chemical Physics, Academy of Sciences of USSR, Vorobyevskoye Chaussée 2-b, 117334 Moscow (USSR) (Leader of Delegation) (also Bureau Member)

Prof. I. V. BEREZIN, Department of Chemistry, Lomonosov State University of Moscow, Leninskii Gory, 117234 Moscow V-234 (USSR)

Prof. V. A. KABANOV, Macromolecular Department, Lomonosov Moscow State University, Leninskii Gory, Moscow V-234 (USSR)

Dr. V. B. KAZANSKY, N. D. Zelinsky Institute of Organic Chemistry, Academy of Sciences of USSR, Leninskii Prospect 47, Moscow V-334 (USSR)

Prof. N. A. PLATÉ, Institute of Petrochemical Synthesis, Academy of Sciences of USSR, Leninskii Prospect 29, Moscow V-71 (USSR)

Prof. Ya. A. ZOLOTOV, V. I. Vernadskii Institute of Geochemistry and Analytical Chemistry, Academy of Sciences of USSR, Vorobyevskoye Chausée 47-a, 117334 Moscow (USSR)

United Kingdom (6)

Prof. T. M. SUGDEN, Shell Research Ltd., Thornton Research Centre, POB 1, Chester CH1 3SH (UK) (Leader of Delegation)

Dr. P. J. AGIUS, Esso Petroleum Co. Ltd., Esso House, Victoria Street, London SW1E 5JW (UK)

Dr. J. W. BARRETT, Monsanto Ltd., Monsanto House, 10-18 Victoria Street, London SW1H 0NQ (UK)

Prof. Sir DEREK BARTON, Department of Chemistry, Imperial College of Science and Technology, South Kensington, London SW7 2AY (UK) (also Bureau Member)

Prof. N. N. GREENWOOD, Department of Inorganic and Structural Chemistry, University of Leeds, Leeds LS2 9JT (UK)

Secretary to Delegation:

Sir DAVID MARTIN, Royal Society, 6 Carlton House Terrace, London SW1Y 5AG (UK)

Bureau Members:

Prof. Sir HAROLD THOMPSON (President of IUPAC), St. John's College, Oxford OX1 3JP (UK)

Dr. H. EGAN, Laboratory of the Government Chemist, Department of Industry, Cornwall House, Stamford Street, London SE1 9NQ (UK) (President of IUPAC Applied Chemistry Division)

United States of America (6)

Prof. C. G. OVERBERGER, 4080 Administration Building, University of Michigan, Ann Arbor, Michigan 48104 (USA) (Leader of Delegation)

Prof. F. BASOLO, Department of Chemistry, Northwestern University, Evanston, Illinois 60201 (USA)

Prof. R. B. BERNSTEIN, Department of Chemistry, University of Texas at Austin, Austin, Texas 78712 (USA)

Prof. H. FREISER, Department of Chemistry, University of Arizona, Tucson, Arizona 85721 (USA)

Dr. R. E. HUGHES, National Science Foundation, 1800 G Street NW, Washington, DC 20550 (USA)

Dr. B. W. ROSSITER, Research Laboratories, B-82, Eastman Kodak Co., 343 State Street, Rochester, New York 14650 (USA)

Secretary to Delegation:

Dr. W. SPINDEL, National Research Council, 2101 Constitution Avenue, Washington, DC 20418 (USA)

Bureau Members:

Dr. R. W. CAIRNS (Vice-President of IUPAC), American Chemical Society, 1155 Sixteenth Street NW, Washington, DC 20036 (USA)

Mr. P. M. ARNOLD, Phillips Petroleum Co., Bartlesville, Oklahoma 74004 (USA)

Venezuela (1)

Yugoslavia (2)

Prof. D. VITOROVIČ, Institute of Chemistry, Faculty of Sciences, University of Beograd, 16 Studentski Trg, POB 550, YU-11000 Beograd (Yugoslavia)

OFFICIAL DELEGATES OF ASSOCIATED ORGANIZATIONS AT 28th CONFERENCE (COUNCIL MEETING)*

Federation of European Chemical Societies

Dr. D. P. DEN OS, Koninklijke Nederlandse Chemische Vereniging, Burnierstraat 1, POB 1766, NL-2077 s'Gravenhage (Netherlands)

*These Delegates have the status of Observer and they are not entitled to vote.

International Society of Heterocyclic Chemistry

Dr. G. GARCIA-MUÑOZ, Centro Nacional de Química Orgánica, Consejo Superior de Investigaciones Científicas, Juan de la Cierva 3, Madrid-6 (Spain)

**OFFICIAL DELEGATE OF INTERNATIONAL
ORGANIZATION FOR STANDARDIZATION**

Dr. G. M. KLINE, 331 South Palmway, Lake Worth, Florida 33460 (USA)

AGENDA FOR 28th COUNCIL MEETING

Madrid, 9 and 11 September 1975

1. Introductory Remarks and Finalization of Agenda
2. Approval of Minutes of XXVII Council Meeting
3. Announcement of Nominations for Officers and Bureau Members
4. Announcement of Time of Elections
5. Statutory Report of President on State of the Union
6. Biennial Report of Treasurer
7. Report of Finance Committee
8. Tentative Budgets for 1976 and 1977
9. Dues Structure and Fixing Annual Dues for 1976 and 1977
10. Applications for Associated Organization Status
11. Reports of Division Presidents and Clinical Chemistry Section
12. Report of Committee on Teaching of Chemistry
13. Report of Committee on Publications
14. Location of Official Headquarters for 1975-9 (Statute 4.3)
15. Language for Official Records during 1975-9 (Statute 5.405)
16. Adoption of Revised Statutes and Bylaws
17. Proposals Formally Received from National Bodies
18. Adoption of Nomenclature Rules
19. Proposals for New Bodies and Dissolution of Existing Bodies
20. Ratification of Decisions taken by Bureau and Executive Committee since XXVII Conference
21. Elections
22. Ratification of Dates and Place of 29th Conference and 26th Congress
23. Place of 30th Conference and 27th Congress
24. Any Other Business (Discussion only)

REPORT OF PRESIDENT ON STATE OF THE UNION

IUPAC 1973-5

It is my statutory duty, at the end of my two-year term as your President, to report to Council on the state of the Union. My first contact with IUPAC was exactly 20 years ago at the Zürich Conference, and I have been involved in it ever since. A comparison of the *Comptes Rendus* of that meeting with those of recent Conferences reveals not only the vast increase in IUPAC's activities, but also the equally vast increase in dues and costs.

During the past 2 years, other than at the meetings to be held in Madrid, the Executive Committee has met in London (March 1974), Brussels (September 1974), and in Moscow (March 1975), and the Bureau in Brussels. Many representatives of the Union have been appointed to attend meetings of other bodies, and they have sent instructive reports for which we were very grateful. As your President, I attended the Congress in Hamburg (1973), the Centenary celebrations of the Society for Analytical Chemistry in London (1974), and I am hoping to attend the Congress in Jerusalem in July.

Perhaps our greatest and continuing anxiety has been the worldwide inflation, and its effect on the operations of the Union in spite of great efforts to economize. However, as you will hear from the Treasurer and see from his report, we have managed far better than we feared. We owe a great debt to Dr. J. W. BARRETT and Members of the Finance Committee for their periodic analyses of our finances, and for many constructive proposals aimed at ensuring our safety. Most of all, however, we must thank our Treasurer, Prof. O. HORN, himself for the care he has shown, and congratulate him on the accounts which he will present. I am well aware that the Division Presidents and Commissions who are keen to get on with their activities have sometimes found it difficult to do so with inadequate funds, and they have been long-suffering. I have always emphasized that IUPAC should weigh carefully against other, on the one hand the loss arising from inadequate financial support for good scientific projects, and on the other, the admittedly undesirable alternative of drawing temporarily on reserve funds. We cannot be sure that the dangers are past, but I hope that it may now be possible to allocate rather more funds for important aspects of our work, and that by becoming more widely known it will lead to a greater income.

In spite of limitations on their expenditure, the Divisions, Sections, and Commissions seem to me in most cases to have continued their work very

well. Judging by the reports and recommendations issued, the regular reports to the Bureau, the Symposia that have taken place, and much correspondence, there has been great activity. No President could in my opinion claim to be familiar with all the details and technical complexities of the work of the different Divisions, and I shall leave the Division and Section Presidents to give accounts to Council themselves. Equally, however, no chemist who studies the content of the *Comptes Rendus*, the *Information Bulletin* and its Appendices, and of our journal *Pure and Applied Chemistry* can fail to be impressed by the enormous range and variety of subjects under examination, many of them having a direct relevance to the life and general welfare of the community.

On some matters, however, where overlap of interests occurs, there seems to be a need for better and regular communication between the Divisions. Of course, to some extent the annual meetings of Division Presidents achieve this. Perhaps an annual circulation among Members of Division Committees of lists of the chief projects being considered by all Commissions would be helpful. It is essential that in making general recommendations the Union shall speak with one voice, and with better liaison undesirable ambiguities will be avoided. In accordance with the decision taken 2 years ago, Presidents have been asked before the next Council meeting to state the justification for the continuance of individual Commissions.

One of the basic obligations of IUPAC is to prepare recommendations for chemical nomenclature, symbols, terminology, and units, and obtain international agreement about them. This has been emphasized repeatedly in Presidential addresses throughout the Union's history. Two years ago, my predecessor stressed this, and I do so again now. Of course, the problems increase and become more complex as the subject evolves, with greater interplay between the traditional branches of chemistry and newer ones. The Union must present a unified and acceptable system not only for pure and applied chemists themselves, but also in advising other international organizations that are concerned with these matters. It seems that in spite of much effort during recent years, our present mechanism may still need to be improved.

Having considered the views of Prof. M. L. McGLASHAN, whose work for us has been both considerable and valuable, of the Presidents of Divisions, the Chairmen of the Clinical Section, and its Commission on Quantities and Units, and others, I have formed the impression that our difficulties might be removed by making only small changes in the existing arrangements. In

my opinion, the existing Commissions for the individual Divisions and Sections should continue. The Interdivisional Committee on Nomenclature and Symbols (IDCNS) should also continue, but in my opinion be reinforced by the inclusion of representatives of other Unions which may be involved in these matters, and by the inclusion of representatives of our own Interdivisional Committee on Machine Documentation, of our Scientific Editor, and any other appropriate person. There is some substance in the suggestion that nomenclature for chemical substances can be regarded as quite separate from questions of symbols, quantities, and units, and to some extent IDCNS could in this sense operate in two parts, but the whole Committee should coordinate recommendations from different groups and seek to eliminate conflicting proposals. If deadlock is reached, the Executive Committee and Bureau should be informed.

It seems to me that lack of intercommunication may have given rise to most of the trouble, and application of the procedures previously proposed at a meeting of Chairmen of the Nomenclature Commissions 10 years ago in Paris, together with others clearly set out in the recent report of the *ad hoc* Committee under Prof. N. LOZAC'H, would remove this difficulty. I hope that terms of reference and procedure can now be laid down formally for all the parties concerned. Some have made a further point, quite rightly in my view, that the specific nature of the work involved in the field of nomenclature and symbols is such that longer terms of membership, at least for some Members of the Commissions, is desirable, and this needs consideration. If increased membership of IDCNS and additional meetings are necessary, I feel that the increased cost for this fundamental matter would be justifiable.

I should mention some other matters arising from the work of the Divisions. Agreement has not yet been reached about the naming of elements of atomic number 104 and 105, and recently the synthesis of 106 has been announced. As agreed at the Munich Conference 2 years ago, I established a neutral group of experts including three members from each of USSR and USA with three others, Prof. U. STILLE, German Federal Republic (of the IUPAP Symbols, Units, and Nomenclature Commission), Prof. A. BAUMGARTNER, Switzerland (of the IUPAP Nuclear Physics Commission), and Prof. J. LEWIS (UK). Meetings have taken place between workers at the laboratories in USA (Berkeley) and USSR (Dubna) and there has been much correspondence. Some progress seems to have been made, but doubts have been cast whether repetition of the original experiments will solve the problem. Meanwhile, the recommendations made earlier by our own

Commission on Nomenclature of Inorganic Chemistry involving a mixture of Greek and Latin nomenclature based on the atomic numbers have been considered by the Bureau and others but not much favoured. An alternative proposal has been made not to name these synthetic elements at all, but to use atomic numbers themselves. If some agreement cannot soon be reached between the American and Russian sides, a decision will have to be made in some other way.

Dr. H. EGAN and his colleagues have been reviewing the programme of the Applied Chemistry Division, its diversification, and its relation with that of the Analytical Chemistry Division, and have laid down some guidelines. Much of the Division's present work is directed to matters concerning food-stuffs and the environment. Problems arising from the use of trivial names, abbreviated names, and cryptograms for chemical substances, are also being considered. Its future activities may be influenced by views awaited from the Company Associates. In this connexion I must thank Dr. BARRETT for arranging meetings of a group of representatives of Company Associates from a number of countries, at which projects appropriate for study by the Union have been discussed. We may look forward with pleasure to a closer relationship between chemical industry and the work of the Union. In my opinion, too, some formal representation of the Company Associates on the Bureau may soon be desirable. It has also been suggested that representatives of the Company Associates might serve as associate members of Division Committees. This seems to me a good idea, and it would be possible within appropriate Divisional Rules. More than 140 Company Associates are now attached to the Union, nearly all from larger, more industrialized countries. We hope to accept members from the smaller countries, too, and I am happy to welcome a recent new Company Associate from Arab Republic of Egypt.

It has recently been suggested that much of the current work of the Applied Chemistry Division, with that of the Clinical Chemistry Section and the Section on Medicinal Chemistry, might be grouped conveniently together within a new Division of Health and Environmental Chemistry. It seems to me that this proposal may have many merits, and it has been referred to the Bureau for consideration at Madrid, so that if thought desirable, a group may be set up to examine it in greater detail, and possibly to plan a reorganization during the next year or two.

There has been an important development in our mechanism for publication. It is now about 18 years since the Union appointed Butterworths as its publisher, and during that period our work has been brought together

successfully in *Pure and Applied Chemistry*, the *Information Bulletin* with its Appendices, the sets of Nomenclature Rules, the *Comptes Rendus*, and in other separate issues. Until recently, the distribution of these publications seemed fairly satisfactory, and the royalties received were a useful addition to the Union's revenue. During the last 2 years, a drop in sales has been noticed. This is undoubtedly due, in part, to more stringent economic circumstances prevailing in many countries, but there have been unjustifiable delays by the publisher, and perhaps inadequate advertising and sales service. The Publications Committee, therefore, with the full approval of the Executive Committee, invited applications from a number of publishing companies in different countries and examined their replies in great detail. It is now recommended that our present contract should be terminated, and that Pergamon Press should be invited to take over the work at the end of the current year. The detailed arrangements which involve a substantial financial guarantee to the Union, are now being worked out. I wish to thank Prof. G. OURISSON and his colleagues for the efficient way in which they have examined this difficult matter.

I should also refer to a recent offer by each of the Chemical Societies of Federal Republic of Germany, USA, and UK, to advance substantial sums so that a revision could be made immediately of the IUPAC Organic Nomenclature Rules, provided repayment is made later from royalties received. The Bureau has agreed to accept this generous offer.

Many requests are now being received for the sponsorship of Symposia by IUPAC. It may become desirable to be more selective in granting this sponsorship. Sometimes, in special circumstances, the Union's right to publish the proceedings in whole or part, has been waived. Last year, in response to a request from a number of distinguished chemists in several countries, and with the approval of the Executive Committee and Bureau, I published in the *Bulletin* a letter about the undesirable proliferation of chemical journals. This received wide publicity through republication and translation in a number of foreign periodicals, and many messages of approval were received.

I am pleased to mention the work of the Committee on Teaching of Chemistry. Last year, after 5 years as its Chairman, Prof. R. W. PARRY felt it necessary to retire. We must thank him very much for the achievements during his period of office and the real interest which he showed. Also, I would record our appreciation of two other Foundation Members of this Committee, Dr. P. SYKES and Prof. J. A. CAMPBELL, who retired after

10 years of membership. The new Chairman is Prof. C. N. R. RAO, who has taken up his duties with vigour. Two years ago, jointly with UNESCO, the Committee organized at Wrocław an International Congress on Improvement of Chemical Education which was widely praised and it is suggested that Symposia on the same theme should be held every 4 or 5 years. A Symposium has been arranged in Madrid, in conjunction with the IUPAC Conference, on Education Technology in the Teaching of Chemistry. Recently, a contract was agreed with UNESCO to advise on the design of a laboratory course for developing countries on which a report will be prepared later this year. Also with UNESCO support, two issues of an *International Newsletter on Chemical Education* have been published, and the Committee has been invited to give general advice on UNESCO's longer term plans for teaching of chemistry. It is important that this Committee should be adequately funded by IUPAC to develop its work, and enabled to give independent and objective advice on a matter which concerns us all.

Our relations with other organizations and agencies have continued to expand. We are involved in various activities with our sister Unions of Pure and Applied Physics, of Biochemistry, and of Pure and Applied Biophysics. Over a number of years, we have been represented at some of the meetings of COSPAR, and this ICSU Special Committee has approached us recently to join in a new project that is being planned on materials in space. I hope that, within our financial means, we shall play a part in such matters if they seem to lie within our competence. The International Union of Pharmacology has also suggested that a Symposium might be arranged jointly with our Clinical and Medicinal Chemistry Sections on the interesting subject of Structure, Activity, and Mechanism of Drug Action, and I hope that in spite of the present commitments of our Clinical Chemistry Section it may prove possible to arrange this in the near future.

As to ICSU itself, to which we are indebted for a share of its subvention from UNESCO, we have maintained a close contact in its Assembly and by correspondence, while Dr. W. GALLAY has represented us on SCOPE, Prof. E. A. PEARSON on COWAR, Dr. J. W. BARRETT on the Abstracting Board, and Mr. D. G. CHISMAN on the Committee for Teaching of Science. On the retirement of Prof. W. KLEMM as our representative on CODATA, Prof. D. H. WHIFFEN took his place.

We continue in addition to participate in the work of a number of inter-governmental organizations. I have noticed the great activity of ISO, to some of whose Technical Committees we have been invited to send delegates

and make recommendations. I have already emphasized in this report the high importance of our work on nomenclature, symbols, and standards. Thought is being given to the way in which the Analytical Chemistry Division and the Commissions on symbols, terminology, or other standards, can contribute effectively in this connexion. Dr. R. MORF has attended some meetings of WHO and given us extensive reports on aspects of its work that may concern us, and representatives have been sent to meetings of WMO.

Since 1966 IUPAC has been advising the European Economic Community about analytical methods in relation to foodstuffs. Some 90 methods have already been supplied, but some difficulties have arisen recently, in spite of much effort by Prof. R. TRUHAUT, Chairman of our Coordinating Committee, to clarify the situation. Our Committee has been uneasy, largely because neither criticism nor approval of its proposals to EEC has been received, and the fate of the recommendations has not yet been established. Part of the problem may arise from the operational mechanism of the intergovernmental committees concerned, and a regular consultation is needed. I intend to accompany Prof. TRUHAUT on a visit to the EEC authorities before our next Council meeting, and hope that we shall be able to delineate a procedure by which this work can continue more systematically and successfully.

We now have 14 Associated Organizations, and in order that we may know more about their current affairs, I have asked them for a short report which may be useful to the appropriate Divisions or Commissions in our Union. Applications have been received from 4 other organizations, namely: GAMS — the group for the development of spectroscopic methods of analysis; the International Association of Water Pollution Research; the International Confederation for Thermal Analysis; and the Association of Editors of European Chemical Journals. These will be considered at Madrid.

Two years ago at Munich, discussions took place about the proposed activities of the Federation of European Chemical Societies (FECS). Regional groups of this sort are, in my opinion, certainly desirable to deal with matters specifically relevant to the region concerned. It is important, however, that undesirable overlap of activities should be avoided, and where some overlap on technical matters must occur that there should be continuous exchange of information so that unified recommendations can be made. In the development of FECS some problems of this kind have arisen, but after further discussions seem now to have been settled. I hope to attend the forthcoming General Assembly of FECS before our meeting in Madrid.

I have to refer to two problems of a political nature, which concern us

very much. The first is the possible membership within the Union of the People's Republic of China. Everyone would be glad if our Chinese colleagues would join us. The difficulty is known to you all, that the People's Republic of China feels unable to do so as long as the Chinese Chemical Society, Taiwan remains a member. The problem is shared by ICSU and the other International Scientific Unions. To break our own Statutes without justification and for political reasons would be a dangerous course of action. At any rate, I wrote at the start of this year to the authorities in Peking inviting them to make an application for membership, but have received no reply.

The second matter concerns visas to enable *bona fide* chemists to enter countries and attend official IUPAC Symposia or meetings. Last year we were faced with this problem on several occasions, and I regret to say that it still exists. At the General Assembly of ICSU last September, a formal resolution was adopted overwhelmingly by all Unions and National Members, with the effect that if adequate and proper notice of requests for visas to enter had been given but refused, meetings or Symposia in the country concerned would be transferred elsewhere until more satisfactory circumstances existed. Very recently, one of our sister Unions gave a warning of this kind, and I foresee a similar situation arising for IUPAC in the near future. Your Executive Committee and Bureau may have to face very difficult decisions.

Now I would like to consider some aspects of the future of this Union. First, there will be laid before Council at the Madrid Conference a draft of revised Statutes. The circumstances which made a revision of the 1965 Statutes necessary were clearly stated by Prof. J. BÉNARD in his address to you 2 years ago. The proper evolution of the Union's structure had made the earlier Statutes incomplete and terms of reference were often uncertain. New mechanisms had gradually come into use that needed to be incorporated into the Statutes and Bylaws. Some matters were of a minor nature requiring small verbal alteration. On all others, the Bureau, Division Presidents, and others as appropriate, have been consulted. I cannot express too strongly my gratitude to Sir DAVID MARTIN and his Committee for the way they have worked on this revision, and taken into consideration all points that have been raised. Since the new draft Statutes were circulated I am told that no serious points of principle have been received from National Members by the statutory date, although a few verbal changes for clarification have been suggested which can be easily made. As far as can be seen, the revised form will cater for all present needs and those foreseeable in the immediate future. I hope therefore that they will be accepted. To propose at this stage any

fundamental change in one place might indeed have implications in another place and make it necessary to delay acceptance until 1977, which would be very unfortunate.

I would like to comment on two specific points. First, it has been suggested by one National Adhering Organization that the efficiency of our present Secretariat and the work of the Executive Secretary, now makes the Office of Secretary General unnecessary. I regret to have to disagree strongly with that suggestion, and I know that my predecessor, Prof. BÉNARD, is of my opinion. The functions of the Secretary General and Executive Secretary are entirely different. It is also essential for the President to be able to seek opinion from several other Officers on matters, often of a confidential nature, which arise from time to time, even involving the Secretariat, and the existence of a Secretary General, who is indeed by the Statutes responsible for the Secretariat, is absolutely necessary.

Secondly, it has been suggested by two National Adhering Organizations that if the revised Statutes are accepted, the present Standing Committee on Statutes and Bylaws should be dissolved. I agree with that proposal. I hope that a revision of Statutes of this magnitude will not be necessary for many years to come, by which time the present Members of the Committee may be out of touch with the Union's affairs, and it would therefore be better to set up a new Committee at the appropriate time. If minor changes are needed more frequently, there would be no difficulty in allowing the Bureau, or if necessary, an *ad hoc* Committee, to make the appropriate recommendations.

These matters are, however, all internal affairs within our Union. But there are in my opinion wider external issues affecting the Union's future which I hope will be considered. First, the Union of Pure and Applied Chemistry, although primarily devoted to the development of chemistry in all its aspects must also not only serve the community, but be seen to serve the community. In many respects, as regards foodstuffs, the environment, and in providing control standards and in other ways, we are already doing so, but we must make our work more widely appreciated. In this sense, I am very sympathetic to the proposals recently received from the US National Committee about chemistry applied to world needs and to be discussed by the Bureau, and Council, and I hope that immediate steps can be taken to deal with them. In this connexion, too, I regard it as a proper duty of the Union to provide advice for the developing countries about the transfer of technology. I am fully aware of some of the problems arising in a matter of this kind, but a determined effort should in my opinion be made. It is planned next year to

arrange a Symposium on Techniques for the Retrieval of Chemical Information, and I am hoping that we may expose to the world community the recent advances of which many are still unaware and which can be of particular value. Similarly, I hope that the lecture to be given to us by Lord TODD during the Council meetings in Madrid, an innovation, may be the first of many authoritative talks about chemistry and the future.

Secondly, I have felt for some years past that we need to bring younger people into the work and affairs of the Union. It is not so much that they shall take an active part in technical discussions, although if they are knowledgeable I do not see why they should not do so, but that they shall learn about the Union's work and form what our German colleagues would call 'Nachwuchs' – a rising generation – who may step into our administrative affairs later on. If a limited number of such younger chemists were allowed to attend our Commissions or other meetings as Observers, it might have valuable consequences. Last year, I raised this matter with the Executive Committee and Bureau and with their approval sought funds and have obtained them from an English Foundation to support attendance by a few people each year at our meetings. I understand that several other countries through their Adhering Organizations will do the same. The scheme would, of course, be open to all member countries. The intention is that a country shall hold some funds for this purpose, select its own candidates appropriate to specific Commission or Committee meetings, request the Secretariat to obtain approval of the Chairman concerned, and pay the travel costs. Holders of the bursaries would not attend meetings of the Executive Committee or Bureau, or in this capacity, a Congress. I hope that this scheme can be approved so as to start after our next Council meeting. The attendance each year of say 30 or 40 younger chemists from many countries, spread among the Commissions, could only be beneficial.

Thirdly, it is desirable that IUPAC should do all it can to improve the image of chemistry, which in many countries today is not what it should be. Many of the difficulties arise from an inadequate understanding among the general public, and the subject should be exposed more favourably in all the modern media.

Lastly, I have become uneasy about the size of many of the Congresses of this and other Unions. By tradition, every host country has been allowed to plan the topics of a Congress, and it is understandable that every country wishes its meeting to be successful. I am inclined to think, however, that some restraint is desirable, and that the rising costs of travel in any case

make it necessary to limit the scope.

I cannot mention individually all those who will retire this year from the work of the Union, but I thank them all collectively for what they have done for us, and I hope that they will spread information about our activities. I must, however, refer to a few special cases. Prof. O. WICHTERLE comes to the end of his term as Past-President of the Macromolecular Division, which he did so much to create and develop. We hold him in high esteem, and it is a matter of very great regret that he has been prevented from attending our meetings during recent years. At the request of some of you, I wrote to him on his 60th birthday. I hope that our thanks, affection, and good wishes, can be conveyed to him. Prof. W. KEMULA also ends his term as Past-President of the Analytical Chemistry Division, although I think he may continue to be connected with one of its Commissions; we thank him, too, for his long service. Mr. P. M. ARNOLD, a member of our Executive Committee, has decided to retire this year, concurrently with his retirement from his industrial post. He has worked keenly for the Union over many years, and many of us will miss his friendship, wise counsel, and judgement in our affairs. We wish him well in his retirement. Mr. J. BROCARD, too, comes this year to the end of his term on the Finance Committee, where he has given us much excellent advice, and we thank him also for his work on the Statutes Committee.

I owe a personal debt to my fellow Officers and the other Members of the Executive Committee and Bureau, who have been kind to me at all times, and have made our meetings a pleasure. Our Secretary General, Dr. GALLAY, is retiring at this Conference. I have appreciated his counsel on a number of difficult matters, and he has played a very active part in the ICSU Committee SCOPE; we are much indebted to him. Prof. BÉNARD completes his term as Past-President. I will not repeat what I said about him 2 years ago, except to say that his opinions have been of the greatest value to me, and he has been a fine colleague and friend.

Most of all, perhaps, I should thank Dr. M. WILLIAMS, our Executive Secretary, and the members of the Secretariat. Living nearby, I, more than anyone, know the problems Dr. WILLIAMS has faced during the past year. He continues to take meticulous care in the documents provided for us, and I record here formally our warm appreciation of his work.

Dr. R. W. CAIRNS will assume the Presidency at the end of the next council meeting. Apart from much else, he brings to us a wealth of experience in

applied chemistry at a time when a proper interplay between the pure and applied sides is very much in our minds, and I wish him well.

H. W. THOMPSON
President

9 June 1975

BIENNIAL REPORT OF TREASURER FOR 1973-4

Following the commencement of new activities in Cortina d'Ampezzo in 1969 and the IUPAC Conference in Washington with a deficit of \$50,300, the first task of the Treasurer had to be the establishment of a more healthy financial basis for IUPAC in order that its activities could be safeguarded. This was possible for the first time in 1971/2 with an effective surplus of \$27,100 and was continued in the 1973/4 biennium thanks to the activities of the Finance Committee under the Chairmanship of Dr. J. W. BARRETT and the support of the Division Presidents whom I should like to thank for their understanding attitude.

As a result of financial support totalling \$16,162 from Deutsche Forschungsgemeinschaft, Verband der Chemischen Industrie, the City of Munich, and the Bavarian chemical industry, in addition to the free photocopying service provided by Infotec-Kalle and the free microphone equipment from Siemens, it was possible despite growing inflation to keep to the budget for Munich (\$157,427) and even to conclude the Conference year 1973 with a surplus of \$26,605.

The following list reveals how the costs of the IUPAC Conference have risen over the years:

1953	Amsterdam	\$15,622
1955	Zürich	\$11,663
1957	Paris	\$34,585
1959	Munich	\$41,603
1961	Montreal	\$60,874
1963	London	\$72,847
1965	Paris	\$77,955
1967	Prague	\$38,486
1969	Cortina	\$90,584
1971	Washington	\$176,782
1973	Munich	\$157,427
1975	Madrid	(\$175,500)

If we wish to continue conducting our Conferences in the same way as in the past, we must therefore endeavour, in years when no Conference is held, to set aside money as a reserve. In view of the worldwide growth in inflation, we must endeavour to obtain additional funds and above all to

economize.

In 1974 it was again possible to achieve a good result and to show a surplus of \$97,347 which, after allowing for savings of \$26,000 made by the Divisions, actually amounted to \$71,000. This result was only possible after several National Adhering Organizations paid already in 1974 the higher subscriptions decided on in Munich, more Company Associates had been gained, and by switching our financial investments we were able to earn higher returns.

Our future situation, which unfortunately does not look as encouraging as in the past 2 years, requires that each country pays its subscription in the category corresponding to its chemical sales. Unfortunately, there are still a number of countries that disregard this requirement. Although the contributions of the Company Associates have grown to about half the subscriptions from National Adhering Organizations, there are still some countries which have well-known chemical companies but have gained only a few Company Associates or none at all. The injustice which this involves represents a risk to the revenue of IUPAC. It is to be hoped that through the International Company Associates Group Dr. BARRETT will be able to break the ice here and interest other sections of the chemical industry in IUPAC. We are grateful both to UNESCO and the European Community for the assistance which they provide by way of contracts. Both contracts are well suited for making a contribution towards increasing the quality of life of mankind. The tax exemption achieved in 1971 continues by way of refunds to have a favourable effect on our finances. Unfortunately, the proceeds from the publications agreement with Butterworths are dropping.

A complaint already raised earlier needs to be repeated here. A number of countries are very slow in paying their annual subscriptions and at times are 1 or more years in arrears although the last date for payment is 31 December. Rather more cooperation is desirable here. Because our financial year ends on 31 December it would appear logical to the Treasurer that his period of office should end with the calendar year. This view is supported by our auditors, our bank, and the Finance Committee.

Particular thanks are due to all those members of Committees and Commissions whose actual expenses often cannot be fully reimbursed and to all those whose organizations frequently bear the full costs, even though much valuable time is sacrificed through this work. Our administrative costs, which are not inconsiderable and which rise as a result of inflation, we attempt to keep as low as possible in order that we can make available to

the Divisions the necessary funds for their work. I should also like to thank Hoechst AG for having borne in full the Treasurer's costs throughout his term of office. I am particularly grateful to Dr. M. WILLIAMS and Mr. R. J. M. RATCLIFFE and their colleagues in the Secretariat at Oxford for the splendid work accomplished. In order to reduce the administrative costs in the Divisions, more use should be made of the services offered by the Secretariat. I should also like to express my thanks to Mr. Th. FEHR of Schweizerische Bankgesellschaft Zürich for the excellent administration of our finances.

The good cooperation with the President, Sir HAROLD THOMPSON, the Executive Committee, and the Division Presidents, has been a prerequisite for the Treasurer's success and my special thanks are due to them all. I also wish to thank all the members of Committees and Commissions for their support and understanding when economy measures were necessary which were only taken reluctantly by the Treasurer. The financial results which reflect all your efforts are contained in the Income and Expenditure Accounts and the Balance Sheet in the report of our auditors, Neutra Treuhand Zürich.

O. HORN
Treasurer

26 April 1975

INCOME OF IUPAC FROM NATIONAL ADHERING ORGANIZATIONS AND COMPANY ASSOCIATES IN 1974

Country	Category by Chemical Turnover	Category Chosen	National Contribution \$	Company Associates† \$
Arab Republic of Egypt	D	C	800	—
Argentina	B1	B1	1,000	—
Australia	B1	B2	5,000	500
Austria	B1	C	800	—
Belgium	B2	B2	3,500‡	1,000
Brazil	B2	C	800‡	—
Bulgaria	D	C	800‡	—
Canada	B2	A1	9,000	500
Chile	—	D	200‡	—
Colombia	C	C	800‡	—
Cuba	D	D	200	—
Czechoslovakia	B2	B1	1,450	1,250
Denmark	B1	B1	1,500	—
Federal Republic of Germany	A2	A2	12,030†*	7,750
Finland	C	B1	1,500	—
France	A1	A1	7,350*	3,500
German Democratic Republic	A1	B1	1,500	—
Greece	C	D	200‡	250
Hungary	B1	B1	1,400	—
India	B2	B2	3,500‡	250
Ireland	C	D	200	—
Israel	C	B1	1,500	—
Italy	A1	A1	9,000	1,250
Japan	A2	A2	6,600*	10,750
Mexico	B2	B1	1,500‡	—
Netherlands	B2	B2	3,500	—
New Zealand	B1	B1	1,500	250
Nigeria	D	D	200‡	—
Norway	B1	B1	1,500	—
Poland	B2	B2	2,500	—
Portugal	C	C	800	—
Republic of China	C	B1	1,500	—
Republic of Korea	D	C	800	—
Republic of South Africa	B1	B1	1,500	250
Republic of Vietnam	D	C	800	—
Romania	B2	B2	3,500	—
Spain	B2	B1	1,000	—
Sweden	B2	A1	9,000	250
Switzerland	B2	A1	5,000*	4,000
Turkey	C	D	200	—
United Kingdom	A2	A2	13,000*	10,250
USA	A3	A3	25,000*	19,250
USSR	A2	A1	10,000	—
Venezuela	B1	D	200	—
Yugoslavia	B1	C	800	—

* Made up to minimum subscription for relevant Category with subscriptions from Company Associates

† Partially outstanding as at 31 December 1974

‡ Outstanding as at 31 December 1974

¶ Excluding half contributions towards PAC subscription

Zürich, 24 February 1975
Löwenstrasse 56

*To the Executive Committee
International Union of Pure and Applied Chemistry
Zürich—Switzerland*

AUDITORS' REPORT ON ACCOUNTS
Years ended 31 December 1973 and 1974

As auditors of the International Union of Pure and Applied Chemistry we have examined the accounts for the years ended 31 December 1973 and 1974 in accordance with the provisions of the law.

We have come to the conclusion that:

- the balance sheets and statements of income and expenses are in agreement with the books,
- the books of account have been properly kept,
- the financial position and the results of operations are presented in accordance with the principles of evaluation prescribed by the law and the requirements of the statutes.

As a result of our examination we recommend that the accounts submitted to you be approved.

Neutra Auditing Inc.

COMPARATIVE BALANCE SHEETS

(Expressed in

Assets

	1973	1974
Cash in Bank	25,441.58	47,492.14
Short Term Investments	25,000.00	100,000.00
Marketable Securities	297,281.69	297,880.54
Other Assets	1,450.00	618.00

	<u>349,173.27</u>	<u>445,990.68</u>
--	-------------------	-------------------

Note: Subscriptions outstanding as at 31 December 1974 US-\$ 12,500.00

COMPARATIVE STATEMENTS OF INCOME AND

(Expressed in

Income

	1973	1974
<i>Subscriptions</i>		
Current Year	118,400.00	141,300.00
Previous Years	<u>16,300.00</u>	<u>2,700.00</u>
	134,700.00	144,000.00
<i>Company Associates</i>	64,420.14	77,424.12
<i>Interest and Dividends Earned</i>	22,228.30	31,679.65
<i>Publications</i>		
Butterworths	43,174.50	29,501.00
Secretariat	<u>7,274.00</u>	<u>6,829.00</u>
	50,448.50	36,330.00
<i>Other Income</i>		
Special Subventions for		
Munich Conference	16,162.00	0.00
UNESCO Teaching Contract	4,000.00	2,000.00
CEE Contracts	<u>7,176.80</u>	<u>8,126.00</u>
	27,338.80	10,126.00
<i>Exchange Differences</i>	7,547.74	4,556.40
	<u>306,683.48</u>	<u>304,116.17</u>

AS AT 31 DECEMBER 1973 AND 1974

US-Dollars)

Liabilities and Net Worth

	1973	1974
Accrued Liabilities	529.60	
Net Worth:		
Capital Account	107,926.36	107,926.36
Reserve		
Beginning of Year	214,112.08	240,717.31
Excess of Income	26,605.23	97,347.01
End of Year	240,717.31	338,064.32
	348,643.67	445,990.68
	349,173.27	445,990.68

EXPENDITURES—YEARS ENDED 31 DECEMBER 1973 AND 1974

US-Dollars)

Expenditure

	1973	1974
<i>Office Expenses</i>		
General Office and Divisions	1,605.64	4,313.31
Office Secretary General . .	2,149.75	3,626.10
Secretariat Oxford	61,756.80	58,335.00
Audit, Bank Fees, and Other		
Charges	9,846.81	10,345.20
	75,359.00	76,619.61
<i>Travel and Subsistence Allowances</i>	18,303.41	97,855.55
<i>Special Account</i>		
(Munich Conference)	157,427.36	0.00
<i>Publications</i>		
Butterworths	14,456.20	7,105.00
Secretariat	19,444.00	31,242.00
<i>Contributions to Symposia . .</i>	1,915.78	7,000.00
<i>UNESCO Teaching Contract . .</i>	4,000.00	617.00
	290,905.75	220,439.16
<i>Less: Grant from UNESCO Sub-</i>		
<i>vention to ICSU</i>	14,000.00	14,000.00
	276,905.75	206,439.16
<i>Contribution 1973 and 1974 to ICSU</i>	3,172.50	330.00
<i>Excess of Income over Expenditure</i>	26,605.23	97,347.01
	306,683.48	304,116.17

FINANCE COMMITTEE

Report to Council

General Financial Position

In 1973 we were able to report that some progress had been made in reversing the trend of increasing biennial deficits. Our further recommendation, accepted by Council, of an increase in national subscriptions, together with a continued tight control of expenditure and an investment policy to maximize income, have proved sufficient to reverse the trend at least for 1973-4 and for our likely performance in 1975-6.

Despite the great need to transfer some income to reserves, which have fallen from about twice the value of yearly expenditure to about the same value, we have been able and glad to recommend that a sum of up to \$25,000 be made available for new or extended activities in 1975-6.

Investment Income

The annual income rate from the investment portfolio has been raised from \$9,000 in 1972 to \$32,000 in 1974 and we believe this can be maintained through 1975 and 1976.

Expenditure

The Treasurer has been fully supported in his policy of strict expenditure control through 1973 and 1974 and during the present year; but we are also supporting him in the carrying forward for use in 1975 of residual Divisional funds not spent in 1974.

Subscriptions from National Adhering Organizations

The response to the higher subscriptions for National Adhering Organizations agreed to begin in 1974 has been more rapid than budgetted and has been a major factor in the improvement of the general financial picture. Our target of an extra income of \$35,000 no later than 1975 should be reached and exceeded. Continued inflation and need for extended activities in the Union require continued attention to means of increasing income and we are recommending that during 1975-6 there is a review and updating of category allocations according to national chemical turnover. These have not been

changed since the introduction of the present scheme in 1971.

Income from Company Associates

There has been a small but continuous rise in this income, but to ensure its further increase we believe it advisable to keep the unit of subscription at \$250 and to direct all effort to increase the number of Company Associates. We are recommending an urgent study of methods appropriate to improve the transfer of information on IUPAC purposes and activities, an item vital to increasing the support from industry. Cost of such survey could well be defrayed by withdrawing the privilege for Company Associates to receive *Pure and Applied Chemistry* at half price.

Publications Accounts

The experimentation on separate formal financial accounts for publications has fully demonstrated the feasibility and advantages of this change. The 1975 budget has been prepared in this form, as will be the accounts for the biennium 1975-6. The 1975 budget for publications shows a modest excess of income over expenditure after full allocation of all costs to that activity.

Membership

During 1973 Prof. G. E. ZAIKOV (USSR) replaced Dr. R. MORF (Switzerland). We are making recommendations for the replacement in 1974 of Mr. J. BROCARD (France) and Dr. K. HOSHINO (Japan) who retire. We would wish to record our appreciation of the great service given by MORF, BROCARD, and HOSHINO, through their membership of and considerable contributions to the Finance Committee.

J. W. BARRETT

Chairman, Finance Committee

19 June 1975

I. PHYSICAL CHEMISTRY DIVISION

Report of President

All six Commissions of the Physical Chemistry Division and their Sub-Commissions have fulfilled the main items of their programmes outlined at the XXVII IUPAC Conference (Munich, 1973).

Particularly notable are the completion of the revision of the *Manual of Symbols and Terminology for Physicochemical Quantities and Units* [Pure App. Chem. 21, 1 (1970): the Green Book] and the progress in publication of the series of definitive texts on thermodynamics and thermochemistry. The latter are most timely in view of their relevance to the heightening need for efficiency in energy technology. There has also been good progress in the formulation of calibration techniques and materials for a wide range of physicochemical properties, and in the tabulation and assessment of evaluated data on the thermodynamic properties of industrially important gases. The Division is anxious that its work in these and other areas be integrated promptly into industrial practice and welcomes a close collaboration with the Applied Chemistry Division and with the International Company Associates Group.

The Division has continued to play its role in the stimulation of international collaboration in physical chemistry through its support of international conferences and through the encouragement of uniform methods of representation and symbolism of chemical data, notably in spectroscopy, electrochemistry, and colloid chemistry. There has been increased liaison with CODATA in establishing guidelines for the presentation and evaluation of chemical data and this trend will continue.

The Division has set up an *ad hoc* Rules Committee to modernize its internal operations. A set of draft Rules has been prepared and coordinated with the new draft Statutes and Bylaws of the Union. These Rules will be timed to take effect when the new Statutes and Bylaws are approved. Particular attention has been given to make effective use of the proposed new subcommittee structure within the Division as a substitute for the present Sub-Commission structure on which the Physical Chemistry Division now leans heavily.

A *Division Newsletter* has been prepared and published in several national chemical news journals.

Commission I.1: Physicochemical Symbols, Terminology, and Units

The revised *Manual of Symbols and Terminology for Physicochemical*

Quantities and Units is in an advanced stage of publication and should appear as a Green Book before the 28th IUPAC Conference. With publication of this report, Commission I.1 will have completed a major phase of its long-term programme. Much of its current activity involves collaboration with other IUPAC bodies to maintain internal consistency in the units and symbols in IUPAC publications. This work has been done by correspondence and will be extended at joint meetings with Commissions I.2, I.5, I.6, and with the Commission on Quantities and Units in Clinical Chemistry at the 28th IUPAC Conference. There is need to clarify the responsibility for furtherance of IUPAC policy concerning symbols and units between Commission I.1 and the Interdivisional Committee on Nomenclature and Symbols.

Commission I.1 is preparing a report on 'Expressions of Results in Theoretical Chemistry', which should be the basis of draft recommendations to be proposed at the 28th IUPAC Conference. The Commission is also considering the feasibility of formulating recommended symbols for physicochemical quantities and units in a character set adapted to computer requirements.

Commission I.2: Thermodynamics and Thermochemistry

This Commission has extended its vigorous programme of publishing definitive texts on thermochemistry and thermodynamics. *Experimental Thermodynamics* Vol. II has been published as a large single volume (1344 pages). The completion of this work has been a major achievement and the editors (Dr. B. LE NEINDRE and Prof. B. VODAR) and the authors are to be highly commended. Prof. S. SUNNER is editing *Experimental Thermochemistry* Vol. III, which will provide a completely revised account of the calorimetry of the combustion process. Consideration is being given to the production of a Supplement to *Experimental Thermodynamics* Vol. I and to a new volume to update the account of noncombustion calorimetry of a thermodynamic nature given in *Experimental Thermodynamics* Vols. I and II. Also under consideration are volumes dealing with transport properties and with the evaluation of chemical thermodynamic data. Number 18 in the series *Bulletin of Thermodynamics and Thermochemistry* will appear in 1975. A survey of subscribers and others is being conducted and may lead to changes in the contents of future volumes.

Commission I.2 is collaborating with the CODATA Task Group on Key Values for Thermodynamics in the preparation of a new final set and a new tentative set of values, beyond those published in CODATA Bulletin No. 10. The new values will appear as a separate publication in *Journal*

of Chemical Thermodynamics.

The IV International Conference on Chemical Thermodynamics will be held at Montpellier prior to the 28th IUPAC Conference. Prof. M. LAFFITTE is the Chairman of the Organizing Committee. There will be a special session on high temperature chemical thermodynamics arranged by Prof. C. B. ALCOCK. Future Conferences will be held at three-yearly intervals instead of biannually.

A Committee, chaired by Dr. J. D. COX, is reviewing thermodynamic quantities and will report at the 28th IUPAC Conference.

Sub-Commission I.2.1 (Plasma Chemistry) organized an International Symposium on Plasma Chemistry at Kiel following the XXVII IUPAC Conference. A second International Symposium on Plasma Chemistry will be held at Rome next September on the invitation of Prof. E. MOLINARI. It will be preceded by a smaller International Round Table meeting on 'Study and Applications of Transport Phenomena in Thermal Plasmas' at Odeillo on the invitation of Dr. C. BONET. Sub-Commission I.2.1 has established a Committee on Standards of Measurement for Plasma Chemistry. This group met in September 1974 and will submit interim proposals at the 28th Conference. The Sub-Commission is continuing its work on a comprehensive bibliography of the plasma chemistry literature.

Work continues under the supervision of Sub-Commission I.2.2 (Thermodynamic Tables) on the Thermodynamics Tables Project at the Project Centre at Imperial College London under the direction of Dr. S. ANGUS. Work has advanced on assessment and table-making for nitrogen, methane, and helium. Assessment of data on oxygen, air, methane, ethane, and ammonia has been undertaken voluntarily at other Institutes and made available to the Project Centre. The third monograph in the series *International Thermodynamic Tables of the Fluid State—Carbon Dioxide 1973*—is in press. Requests for translation of the first two monographs (*Argon 1971*, *Ethylene 1972*) into Russian have been received. A new version of a report 'Guide to Methods of Correlation' has been prepared at the Project Centre. Publications from the Project Centre have already stimulated new experimental measurements at other Institutes on carbon dioxide, ethylene, and Freon.

The Commission has been instrumental in establishment of the *Inter-Union Committee on Biothermodynamics* between IUB, IUPAB, and IUPAC.

Commission I.3: Electrochemistry

This Commission met at Brighton in September 1974 during a Meeting of

the International Society of Electrochemistry (ISE). The Commission, jointly with ISE, will organize a Symposium on Nonisothermal Electrochemistry at Zürich in September 1976. The Commission plans to emphasize nonisothermal electrochemistry in its ongoing programme.

The nomenclature and symbols report on electrochemistry has been published as Appendix III to the *Manual of Symbols and Terminology for Physicochemical Quantities and Units* [Pure Appl. Chem. 37, 499 (1974)]. Amplification of some sections of this report is planned. Areas for immediate action are interfacial phenomena in electrochemistry, transport phenomena in electrochemical systems, rate constants and transfer coefficients, and the collection of data on conductance. These are interdisciplinary areas and Commissions I.1, I.6, and V.5 will be consulted.

Tables of Standard Electrode Potentials are now in an advanced stage of publication as also is the data collection on electrode kinetics. These are both extensive collections and consideration is being given by the Commission to the preparation of a separate compilation of critically selected data on electrode potentials and related thermodynamic data.

The Commission has supported IUPAC sponsorship of the III International Symposium on Bioelectrochemistry at Julich in October 1975.

Commission I.4: Physicochemical Measurements and Standards

The revision of the catalogue of physicochemical standard substances [Pure Appl. Chem. 29, 597 (1972)] has been completed. Under a new title *Catalogue of Reference Materials for Physicochemical Measurements from National Laboratories* it is under review by the Commission prior to publication. The extensive proceedings of the 1961 Ottawa Purity Symposium are being edited by Drs. C. P. SAYLOR and E. WICHES and will appear as a Special Publication of the US National Bureau of Standards.

A recommendation for a cooperative programme for the redetermination of the density of water over the range 0-40°C has been distributed to some 50 laboratories. The replies are being analysed by Dr. J. TERRIEN (BIPM), who is a Member of the Commission. Closer relations have been established with the International Association for the Properties of Steam concerning this project. Preparation of revised tables for the vapour pressure of water is being delayed by uncertainty about the triple-point pressure, but the tables can be produced quickly once agreement is achieved on this value.

Sub-Commission I.4.1 (Calibration and Test Materials) met at Warsaw in October 1974. It is making excellent progress with its major project of

preparing *Recommendations on Calibration and Test Materials*. An Introduction and chapters on Enthalpy, Optical Refraction, Optical Rotation, Surface Tension, will appear soon in *Pure and Applied Chemistry* [40, 391 (1974)]. The chapter on Density has been approved and the chapters on Optical Absorbance and Wavelength are under review by Commissions I.5 and V.4. Drafts of chapters on Viscosity, Pressure-Volume-Temperature Properties, Thermal Conductivity, Vapour-liquid Equilibria, Reflectance, Potentiometric Ion Activity, Temperature, Molecular Weight, Pressure, Electrical Conductivity, are in draft form for consideration at the 28th IUPAC Conference.

Commission I.5: Molecular Structure and Spectroscopy

This Commission has made progress with its programme of recommendations for evaluation and presentation of chemical spectral data in the literature. The following reports are now in final form and should be ready to submit for approval for publication in *Pure and Applied Chemistry* at the 28th IUPAC Conference:

- (a) Recommendations for Presentation of NMR Data for Publication in Chemical Journals—B. Conventions Relating to Spectra from Other Nuclei
- (b) Recommendations on Nomenclature and Conventions for Reporting Mössbauer Spectroscopic Data
- (c) Recommendations for Nomenclature and Spectral Presentation in Chemical Electron Spectroscopy Resulting from Excitation by Photons

During the current biennium work has progressed, or has been initiated on the following topics:

- (a) Provisional Recommendations on Abbreviations in Spectroscopy (Prof. N. SHEPPARD)
- (b) Provisional Recommendations on Definitions and Symbolism of Force Constants (Profs. Y. MORINO and T. SHIMANOUCI)
- (c) Recommendations for Presentation of Infrared Spectra for Publication in Chemical Journals

The second edition of *Tables of Wavenumbers for the Calibration of Infrared Spectrometers* has been completed in manuscript form by Sub-Commission I.5.1 (Infrared and Raman Spectroscopy: Prof. A. R. H. COLE), and should be ready for publication after the 28th IUPAC Conference. The first edition (1961) covered the range 4000-600 cm^{-1} and is now out of print. A supplement (600-1 cm^{-1}) was published in *Pure and Applied Chemistry*

[33, 605 (1973)]. The new second edition will cover $4000\text{--}1\text{ cm}^{-1}$; many of the higher wavenumber tables and charts are based on new measurements carried out on the instigation of the Commission.

At the 28th IUPAC Conference the Commission will also discuss units and nomenclature for optical rotatory dispersion and circular dichroism and the choice of SI units in spectroscopy.

During the past biennium the Commission has supported the sponsorship by IUPAC of the following meetings: (a) IV International Conference on Raman Spectroscopy (Brunswick, Maine, August 1974); (b) XII European Molecular Spectroscopy Conference (Strasbourg, July 1975); (c) VII International Mass Spectroscopy Conference (Florence, August-September 1976); (d) XVIII Colloquium Spectroscopicum Internationale (Grenoble, July 1975); (e) VI International Symposium on Magnetic Resonance (Banff, September 1977).

Sub-Commission I.5.2 (Storage and Retrieval of Spectral Data) organized a session on Spectral Data at the IV International CODATA Conference (Tsakadzor, June 1974) and has initiated a 'Survey of Machine Readable Spectroscopic Data Bases'.

The new Sub-Commission I.5.3 (Mass Spectroscopy) acquired its full complement of Members during the current biennium and will report on some aspects of the nomenclature of mass spectroscopy at the 28th IUPAC Conference.

Commission I.6: Colloid and Surface Chemistry

The 'Manual of Definitions, Terminology, and Symbols in Colloid and Surface Chemistry—II. Heterogeneous Catalysis' has been published in tentative form [Provisional Nomenclature Appendix No. 39 (August 1974) to *Inf. Bull.*] as also has the document 'Chemical Nomenclature and Formulation of Compositions, of Synthetic and Natural Zeolites' [Provisional Nomenclature Appendix No. 41 (January 1975)]. Work is in hand on a report on nomenclature for bulk rheology. Draft reports are also being prepared by task groups on nomenclature in the areas of Light Scattering, Liquid Crystals, and Surface Rheology. A report on 'dry' electrochemistry is in an earlier phase.

Under stimulation for CODATA's 'Guide to Publication of Data in the Primary Literature', the Commission is preparing more specific guides to the presentation of adsorption data and critical micellization concentrations. Drafts of these reports will be discussed at the 28th IUPAC Conference.

The Commission has collaborated with Comité International des Dérivés

Tensio-Actifs (CID) and sent representatives to four CID meetings. Liaison has also been maintained with the International Congress of Catalysis (ICC). The Commission is encouraging work to create a standard heterogeneous catalyst and is examining the need to provide guidelines for the control of the purity of surfactants.

A student text book *Physical Chemistry: Enriching Topics from Colloid and Surface Science* has been assembled and is in process of publication. Support has been given to the sponsorship by IUPAC of the following meetings: (a) International Conference on Colloid and Surface Chemistry (Budapest, September 1975); (b) International Conference on Colloids and Surfaces (San Juan, Puerto Rico, June 1976).

R. N. JONES

President, Physical Chemistry Division

4 June 1975

II. INORGANIC CHEMISTRY DIVISION

Report of President

Commission II.1: Atomic Weights

At the XXVII IUPAC Conference (Munich, 1973) the Commission was instructed to develop, maintain, and evaluate critically best values and reliabilities of the isotopic abundances of the naturally occurring elements from literature data referring solely to spectrometric investigations. This information is more detailed than required for the Atomic Weights Table for those elements having more than two stable isotopes and this exceeds the previous terms of reference of the Commission.

Responding to this assignment the Commission formed an International Mass Spectrometric Evaluation Group (IMSEG) from those of its Members who are specialists in mass spectrometry. This group should perhaps be recognized as a Sub-Commission with its own budget. Meanwhile, using funds contributed personally by Commission Members and their Institutions, IMSEG has compiled a bibliography and tables containing all relevant values. The critical evaluation has proceeded with much discussion on individual papers in the literature and IMSEG will present a first compilation of best values for the isotopic composition of all elements to the full Commission at the 28th IUPAC Conference in Madrid.

Concurrently, the Commission has proceeded with its traditional tasks. It is an interested party in discussions on definitions of relevant terms including 'atomic weight' itself, which continues to engage chemists. The Commission finds itself more concerned with the scientific exactitude of the meaning rather than the choice of the two words 'atomic' and 'weight'. The Committee on Teaching of Chemistry, in consultation with the Commission, has just issued 'Table of Atomic Weights to Four Significant Figures' in *International Newsletter on Chemical Education* No. 2 (June 1975).

Important new atomic weight data are being published before the Madrid meeting for silicon, potassium, zinc, gallium, barium, and possibly other elements including cadmium. Members are preparing their considered views on this work and on a reexamination of previous experimental work on molybdenum and probably some other elements, so that recommendations in Madrid can be reached efficiently. The Commission intends to comment in its 1975 Conference Report on the determination of Avogadro's constant, published since the Munich Conference, and to discuss its effect on values

in the Atomic Weights Table. Contact with recent work on nuclidic masses and on novel techniques resulting in significant atomic weight values is being maintained. Of ever increasing importance to the work of the Commission are its warnings to users of the Atomic Weights Table which are incorporated in the footnotes. The increasing use of isotopically altered chemicals poses a growing threat to good practice and reliability of chemical science and technology. The commission will not only consider possible rewordings of footnotes and additional annotations, but will also review responses to the tentative proposal for possible labelling of well-characterized chemicals to avoid error from false or inadvertent use of isotopically altered chemicals. For this purpose the Commission has circulated its ideas rather widely through the dissemination of its 1973 Report [*Pure Appl. Chem.* 37, 589 (1974)], on which comments by interested manufacturers and the chemical public are invited. Owing to financial stringencies and publication delays, however, this circulation has fallen somewhat short of the Commission's intent.

Since its inception, IUPAC has accepted the task of disseminating the Atomic Weights Table revised at each Conference. This Table incorporates the most widely used and basic data for chemistry and has received acceptance alike by science, technology, and commerce throughout all nations. Although the accuracy of the data has improved and is still improving almost dramatically, the margin in precision over some available routine and technically significant chemical analyses has never been more dangerously narrow. The task of continuously updating the Atomic Weights Table is likely to remain an exceedingly challenging and significant assignment and it would be unthinkable for IUPAC to abandon its universally accepted leadership in this field. In answer to the request from IUPAC that all Commissions should be asked formally to justify their continued existence it can therefore be stated that:

- (i) the importance of the work of the Atomic Weights Commission is self evident;
- (ii) it is impracticable to carry out this detailed specialized work other than by having a Commission dedicated solely to the evaluation of atomic weight data and cognate matters.

Commission II.2: Nomenclature of Inorganic Chemistry

At a meeting of the Commission in Slaughtam, Sussex, during 12-19 August 1974, the following actions were taken:

- (i) Reaffirmation of its preference for *lanthanoids* and *actinoids* instead of *lanthanides* and *actinides*.
- (ii) Reaffirmation of the need for a numerical system for naming chemical elements prior to their discovery and requested adoption of the Commission's proposal for coining such names.
- (iii) Accepted the latest revision of a provisional document prepared by the Commission on Colloid and Surface Chemistry (I.6) entitled 'Chemical Nomenclature, and Formulation of Compositions, of Synthetic and Natural Zeolites'.
- (iv) Accepted a revision of the rules covering 'Chiral Isomerism'.
- (v) Accepted in principle the incorporation into *Nomenclature of Inorganic Chemistry* (the Red Book) of rules covering 'Nomenclature of Isotopically Modified Compounds'.
- (vi) Accepted in principle the incorporation into the Red Book of rules covering 'Designation of Site Symmetry in Coordination Compounds'.
- (vii) Accepted in principle for publication and eventual inclusion in the Red Book of 'How to Name an Inorganic Substance'; this is in essence a guide to the use of the Red Book.
- (viii) Requested of the Secretariat that steps be taken to encourage the use in IUPAC publications of IUPAC approved rules of nomenclature (a favourable acknowledgement was received).
- (ix) Accepted in principle a document on 'Nomenclature of Hydrides of Nitrogen and Derived Anions and Ligands'.
- (x) Found the proposed revision of Table II in the Red Book to be generally acceptable, but called for further modification, and additions.
- (xi) Discussed at some length a document entitled 'Philosophy and Guidelines', which was designed to define more clearly the objectives of the Commission and its rules of procedure.
- (xii) Discussed extensively Section D to *Nomenclature of Organic Chemistry* [document prepared jointly by Commission II.2 and the Commission on Nomenclature of Organic Chemistry (III.1): 'Rules for Organometallic Chemistry', Tentative Nomenclature Appendix No. 31 to *Inf. Bull.* (August 1973)]. Although the approaches to nomenclature used by organic and inorganic chemists differ significantly, there is distinct progress toward agreement and mutual understanding.

- (xiii) Agreed to cooperate with Commission III.1 in developing a consistent method of representing the structural formulae of coordination and organo-metallic compounds.
- (xiv) Discussed the Nomenclature of Ions and agreed to cooperate fully with the subcommittee of Commission III.1 which has been appointed to study this problem.
- (xv) Discussed extensively the Nomenclature of Inorganic Boron Compounds. The rapid growth of this field produces new problems more rapidly than old ones can be solved.
- (xvi) Discussed the Nomenclature of Cluster Compounds. The Commission now has a grasp of the multitude of ramifications of the subject and a few possible approaches to a solution.
- (xvii) Discussed once again the Nomenclature of Inorganic Ring and Chain Compounds.
- (xviii) Discussed the 'Nomenclature of Highly Fluorinated Inorganic Compounds'. The Commission made no final decisions, but narrowed the choices.
- (xix) Considered two related documents: 'Designation of Coordination Sites in Ligand Names' and 'Naming of Complexes Containing Complex Organic Ligands'. Made progress in a difficult but very important area.
- (xx) Recommended the appointment of three National Representatives.

Since the Slaugham meeting the following things have been done:

- (a) The revision of the documents given in (v), (vi), (vii), and (x) has been completed. Copies have been sent to all Members of the Commission.
- (b) A first revision of document (ix) has been distributed for comment.
- (c) A document on 'Nomenclature of Inorganic Heterocycles' has been submitted to the Commission. It has been distributed for comment.
- (d) Three Members of the Commission met to work on the document in (xv). Two additional meetings of two Commission Members are scheduled.
- (e) Other documents are being readied for the next meeting of the Commission.
- (f) The three National Representatives have been formally appointed.
- (g) Dr. G. H. CHEESMAN is preparing a history of the activities of the Commission.

Commission II.3: High Temperatures and Refractory Materials

(i) The *Bibliography of High Temperature Chemistry and Physics of Materials* continues to grow and is now financially self-supporting. The possible incorporation of a data-flagging system is at present under consideration.

(ii) The Task Force on Melting Points has completed its work on alumina and is now engaged in work on yttrium sesqui-oxides, including the effects of the oxygen pressure of the atmosphere on the melting point, resulting from changes in stoichiometry.

(iii) The second conference on High Temperature Techniques has been held in 1974 at Toronto and a large selection of papers submitted are printed or are in the process of being printed. A Panel Meeting will be held at the IV International Conference on Chemical Thermodynamics (Montpellier, 1975) to discuss new collaborative studies.

(iv) An international collaborative study on solid oxide electrolytes has been initiated, in order to establish reference electrodes to be used in high temperature and solid state electrochemistry.

(v) Prof. E. FITZER is actively engaged with an International Task Force on characterization of carbon. The effort will include characterization and nomenclature arrived at on scientific grounds. Samples have been distributed to collaborating laboratories for comparative measurement with standard procedures.

(vi) A new Task Force will classify procedures of measuring temperatures by optical pyrometry.

All three Commissions should be allowed to continue in existence.

V. GUTMANN

President, Inorganic Chemistry Division

27 May 1975

III. ORGANIC CHEMISTRY DIVISION

Report of President

The Organic Chemistry Division has continued a programme of activity based largely on the organization and sponsorship of symposia and on the work of its Commissions and Section.

The symposia are of two types—those covering very broad areas of organic chemistry and those of a more specialized nature. Among those in the first category, the biennial Symposia on the Chemistry of Natural Products are of longest standing; the IX Symposium in this series was held in June 1974 in Ottawa and maintained in excellent fashion the high standards of its predecessors. The relatively new series of Conferences on Physical Organic Chemistry was very successfully nurtured by the II Conference held in April-May 1974 in Noordwijkerhout. The period since the XXVII IUPAC Conference in Munich (1973) has also seen the birth of a third series of general symposia—Symposia on Synthetic Organic Chemistry, first conceived by the Organic Chemistry Division Committee at the XXV IUPAC Conference in Cortina d'Ampezzo (1969). The I International Conference on Organic Synthesis was held in August 1974 in Louvain-la-Neuve and provided a very fitting inauguration for this series.

Of the more specialized symposia, some are referred to in the reports of the Commissions and Section below. Others sponsored by the Organic Chemistry Division included the IX International Conference on Organic Phosphorus Chemistry in September 1974 in Gdansk, II International Symposium on the Chemistry of Nonbenzenoid Aromatic Compounds in September 1974 in Lindau, and VII International Symposium on Carbohydrate Chemistry in August 1974 in Bratislava. It is unfortunately necessary to report that restrictions were placed on the free admission of *bona fide* chemists at the meeting in Bratislava.

The work of the Commissions and Section is reported below. It may be noted here that the former Commission III.2 on Chemical Taxonomy was dissolved at its own request after the Munich Conference because most of its aims had been achieved. The establishment of the present Commission III.2 on Physical Organic Chemistry was recommended by the Division Committee in Munich and effected in January 1974.

Commission III.1: Nomenclature of Organic Chemistry

The Commission met in Dorking on 13-20 July 1974. It and the IUPAC-IUB

Commission on Biochemical Nomenclature (CBN) have jointly issued 'Nomenclature of Cyclitols' [*Pure Appl. Chem.* 37, 283 (1974)], and have approved for publication recommendations on 'Nomenclature of Carotenoids' and 'Nomenclature of α -Amino Acids'. Other topics being studied by these two Commissions are the nomenclature of lipids, lignins, prostaglandins, tetrapyrroles, carbohydrates, and other natural products.

In cooperation with the Commission on Nomenclature of Inorganic Chemistry (II.2) the Commission has worked on the finalization of *Nomenclature of Organic Compounds: Section D* (P, B, Si, etc., compounds). *Section E, Fundamental Stereochemistry*, has been approved for final publication. Documents now being studied are: 'Natural Products and Related Compounds'; 'Isotopically Modified Compounds'; 'Phane Nomenclature'; and 'Nodal Nomenclature'. The Bureau has approved the proposal of Commission III.1 for revision and simplification of *Nomenclature of Organic Chemistry, Sections A, B, C, and D*.

After the Dorking meeting, the work of the Commission has continued in various areas; for instance, new drafts have been distributed concerning 'Nodal Nomenclature' and 'Labelled Compounds'. Two new Associate Members have been appointed, namely: Dr. W. H. POWELL (USA) and Dr. H. J. ZIEGLER (Switzerland). A new working party on the 'Nomenclature of Anions, Cations, and Radical Ions' has been organized. Steps have been taken to engage a fulltime collaborator in charge of the general revision of Sections A, B, C, and D.

CBN, which is attached jointly to the Organic Chemistry and Macromolecular Divisions in the case of IUPAC, met at Santiago de Compostela on 3-6 May 1974. It has issued 'Nomenclature of Corrinoids' [Provisional Nomenclature Appendix No. 40 (August 1974) to *Inf. Bull.*]. The following recommendations have been published in *Pure and Applied Chemistry*: 'Nomenclature of Quinones with Isoprenoid Side-chains' [38, 439 (1974)]; 'Abbreviations and Symbols for Nucleic Acids, Polynucleotides and their Constituents' [40, 277 (1974)]; 'Abbreviations and Symbols for Description of Conformation of Polypeptide Chains' [40, 291 (1974)]; 'Nomenclature of Multiple Forms of Enzymes' [40, 309 (1974)]; 'Symbols for Amino Acid Derivatives and Peptides' [40, 315 (1974)].

Commission III.2: Physical Organic Chemistry

The Commission, consisting of 7 Titular Members, was formed in January 1974 and charged with the task of standardizing the nomenclature used in

physical organic chemistry, particularly with regard to the naming of reactions, the mechanisms of reactions, and the definitions used in this field of chemistry.

A summary of Members' proposals for the solution of these problems was prepared and discussed by 4 Members of the Commission at Noordwijkerhout on 30 April 1974. It was decided that the first priority was (i) to establish contact with other IUPAC Commissions, and (ii) to elicit proposals for the tasks at hand from physical organic chemists. This could be achieved by alerting the chemical community to the purposes and aims of the Commission by means of announcements in periodicals and journals. These proposals were approved by the other Members of the Commission and the minutes of this meeting were published in *Information Bulletin* No. 48 (October 1974).

In accordance with the first proposal, Prof. A. R. H. COLE has been appointed an Associate Member of the Commission in order to effect liaison with the Physical Chemistry Divisional Committee. Concerning the second proposal, 3 reports (*ca.* 250, 700, and 2000 words), describing the tasks facing the Commission, have been prepared and approved by Members of the Commission. The shortest report has been circulated to editors of national chemistry news journals with the request that they publish it in their respective journals. They were advised that fuller reports were available. The Commission is looking forward to the reaction to this report.

Commission III.3: Organic Photochemistry

The Commission closely supported the V IUPAC Symposium on Photochemistry held at Enschede in 1974. At the Munich Conference it developed a strong interest in seeing photochemical methods gain more use in synthesis. Consideration was given to organizing a one-day symposium at the next IUPAC Congress. Later it was decided that it would be more effective to support a EUCHEM Research Conference on Useful Preparative Aspects of Photochemistry than to organize a competing symposium on the same topic. Contact with the Organizing Committee of the EUCHEM Conference was established, and the Chairman of the Commission on Organic Photochemistry served on the Scientific Committee for that EUCHEM meeting.

The Commission has made slow progress on developing recommendations on the reporting of photochemical data and adequate descriptions of filters and lamps. There is great interest among photochemists in this project, but progress has been hindered consistently by the lack of input from physical, inorganic, and photobiological chemists.

The Commission Members present at the V IUPAC Photochemistry Symposium met with the European Photochemistry Association at Enschede and also held an informal meeting of the Commission. Unfortunately, a quorum was not present. The problems involved in reporting photochemical data, *etc.*, were the principal topic discussed.

Section III.4: Medicinal Chemistry

The Section held a business meeting at Noordwijkerhout on 8-9 September 1974. It cosponsored and participated actively in planning the IV International Symposium on Medicinal Chemistry at the same time.

The Section issued a report on 'Education of Medicinal Chemists' [Technical Report No. 13 (August 1974), an Appendix to the *Information Bulletin*]. This was the culmination of 4 years work by an *ad hoc* Committee headed by an interested nonmember, the late Prof. E. E. SMISSMAN. It is a landmark and plans are to keep it current with suitable supplements at regular intervals. In this connexion the preliminary plans for the VI International Symposium on Medicinal Chemistry, to be cosponsored by the Section and the Society for Drug Research in London (1978), include a workshop on the training of medicinal chemists.

The Section issued a report ' "Predicted" Compounds with "Alleged" Biological Activities Derived from Analyses of Structure-Activity Relationships: Implications for Medical Chemists' in *Information Bulletin* No. 49 (March 1975).

It is currently involved in planning the V International Symposium on Medicinal Chemistry (Paris, 1976) to be cosponsored by Société Chimie Therapeutique and the already-mentioned VI Symposium.

The Section has continued issuing its Newsletter semi-annually. Newsletter Nos. 8, 9, and 10 have appeared since Munich (August, 1973) and No. 11 is being prepared for publication in June 1975. Primary distribution is now about 180 copies with duplication and distribution by national bodies increasing this figure several fold.

A. KJAER

4 June 1975

President, Organic Chemistry Division

IV. MACROMOLECULAR DIVISION

Report of President

The Macromolecular Division has continued a programme of activity based largely on the organization and sponsorship of symposia and on the work of its Commissions and Working Parties. The symposia are of two types: one covering a broad field of macromolecular science which are called the macro-symposia and the other on a well-defined topic in the development of our discipline which we call microsymposia. The symposia sponsored during 1973-75 are listed hereunder.

Macrosymposia

In the 24th IUPAC Congress in Hamburg (2-8 September 1973) a section was devoted to high polymers

The 22nd International Symposium on Macromolecules held in Aberdeen, UK, 10-14 September 1973—organized by Prof. BURNETT

The International Symposium on Macromolecules held in Rio de Janeiro, Brazil, 21-31 July 1974—organized by Mrs. ELOIS MANO

The 23rd International Symposium on Macromolecules held in Madrid, 15-19 September 1974—organized by Dr. FONTÁN

The 24th International Symposium on Macromolecules (3rd Aharon Katzir Katchalsky Conference) held in Jerusalem, 13-18 July 1975—organized by Prof. SILBERBERG

Microsymposia

Following a tradition established by Prof. WICHTERLE and Dr. SEDLÁČEK the Czechoslovak Academy of Sciences organizes every year microsymposia in Prague or its vicinity.

XIV Microsymposium on Crosslinking and Networks, Prague, 26-29 August 1974

XV Microsymposium on Degradation and Stabilization of Polyolefins, Prague, 21-25 July 1975

4th Discussion Conference on Heterogeneities in Polymers, Mariánské-Lázně, 2-5 September 1974

Other microsymposia which have been organized include:
2nd Aharon Katzir Katchalsky Conference—biopolymer Interactions: Workshop on Physical Chemistry of Biologically Active Assemblies, Amsterdam, 2-6 September 1974—organized by M. MANDEL

Polymerization of Heterocycles (Ring Opening), Jablonna, Poland, 23-25 June 1975—organized by S. PENCZEK and P. REMPP

Modified Polymers, their Preparation and Properties, Bratislava, 30 June-4 July 1975—organized by A. ROMANOV

This type of symposia have been very useful and will be continued; the Division Committee has already sponsored five new microsymposia for the next years.

One of the problems of the Macromolecular Division is the broad field which has to be covered by its activities going from biological problems to fundamental problems of organic chemistry, physical chemistry and pure physics. This explains the large variety of topics covered by these microsymposia.

Commission IV.1: Macromolecular Nomenclature

The work of the Commission has resulted in three publications—two of these have now been published in the journal *Pure and Applied Chemistry* and the third is published as an Appendix to the *IUPAC Information Bulletin*:

List of Standard Abbreviations (Symbols) for Synthetic Polymers and Polymer Materials—*Pure Appl. Chem.*, **40**, 473-476 (1974)

Basic Definitions of Terms Relating to Polymers—*Pure Appl. Chem.*, **40**, 477-491 (1974)

Nomenclature of Regular Single-strand Organic Polymers—Tentative Nomenclature Appendix No. 29 (November 1972) to *IUPAC Information Bulletin*.

The last item, in particular, has been very well received and has been reprinted this year in *Macromolecules* and the *Journal of Polymer Science*. Many comments on these recommendations (then tentative) were received and they were discussed and evaluated in our last three meetings, Knokke (1972), Munich (1973) and Santiago di Compostella (1974). Other topics on which the Commission is working are:

- (a) Stereochemical Designations for Macromolecules
- (b) Subsidiary Definitions of Terms Relating to Polymers
- (c) Nomenclature and Symbolism of Copolymers
- (d) Definition and Nomenclature of Ladder Polymers
- (e) Nomenclature of Inorganic Polymers

Of these (a) and (b) are at an advanced stage.

Through exchange of observers and correspondence our Commission

cooperates closely with many commissions and committees engaged in nomenclature work of overlapping interest. Amongst these TC 61 (Plastics) of the International Standards Organization(ISO) and the Commission on Biochemical Nomenclature(CBN) of IUPAC-IUB should be singled out.

Commission IV.2: Polymer Characterization and Properties

The creation of this new Commission had been decided in Munich (1973). Its creation resulted from the need for coordination and control of the existing Working Parties and for the creation of new Working Parties. So far its activity has been very limited due to the fact that the programme of the actual Working Parties is well-defined without overlap. However, the Commission is foreseen to increase its activity if it is possible to organize a new 'Working Party on Thermodynamic Parameters of Industrially Important Polymers' and with the joining of the 'Working Party on Supported Polymer Films' and the 'Working Party on Structure and Properties of Commercial Polymers'.

Working Party on Structure and Properties of Commercial Polymers

The Working Party had continued its various collaborative investigations aimed at a better understanding of the relationship between molecular and supermolecular structure, on the one hand, and basic rheological and mechanical behaviour, processing and end-use properties of industrially important macromolecular materials, on the other.

Regular meetings held in order to select and discuss possible topics of collaborative investigations, to plan detailed programmes and appropriate time schedules, and finally to discuss Progress and Final Reports prepared by the programme coordinators, took place at the following dates and locations:

7-8 September 1973	Netherley, Scotland
21-22 February 1974	Brussels, Belgium
28-29 November 1974	Ludwigshafen, Federal Republic of Germany
19-20 June 1975	Paris, France

Two Final Reports were presented at a special session of the IUPAC-International Symposium on Macromolecules, Aberdeen, 10-14 September 1973. The first report 'A Collaborative Study of the Dynamic Mechanical and Impact Properties of PVC, Part II' by A. GONZE and J. C. CHAUFFOUREAUX (Solvay, Brussels), was published in *Pure Appl. Chem.*, **35** (3), 315 (1973). The second report, presented at Aberdeen: 'The Effect of Molecular

Orientation on the Mechanical Properties of Polystyrene', by T. T. JONES (Monsanto Ltd., Newport), was in the press for publication in *Pure and Applied Chemistry*.

At the IUPAC International Symposium on Macromolecules, held in Madrid, 15-20 September 1974, two other Final Reports were presented at a special session: 'The Relationship between Basic Parameters, Melt Rheology, Processing and End-Use Properties of Three Samples of Low-density Polyethylene' by J. MEISSNER (BASF, Ludwigshafen) and 'A Collaborative Study of Capillary Flow of a Highly Lubricated Unplasticized Polyvinyl Chloride', by J. L. S. WALES (T.N.O., Delft). The first-mentioned Report is in process of publication in *Pure and Applied Chemistry*, the second one is to be published in a special issue of *Journal of Polymer Science*, Part C, devoted to the Madrid Symposium on Macromolecules (1974).

As to the programmes in actual progress, the situation may be summarized as follows:

The first draft of a Final Report on 'A Collaborative Study on Tensile Properties of PVC—The Long Time Transition' was prepared by J. C. CHAUFFOUREAUX (Solvay, Brussels) and will be submitted in 1975 for publication in *Pure and Applied Chemistry*.

An extensive experimental programme on 'The Effect of Molecular Orientation on the Structure and Properties of two samples of Rubber-modified Polystyrene' was started in 1974 and is coordinated by W. RETTING (BASF, Ludwigshafen) and J. ZELINGER (Technical University of Prague). A first Progress Report on this programme is expected in November 1975.

Another programme on 'The Effect of Fillers on the Tensile Properties of Unplasticized PVC', coordinated by J. CHAUFFOUREAUX, is scheduled to be finished before the end of 1975.

Finally, a programme on 'The Effect of Domain Structure on the Rheological Behaviour of a Tri-Block-Copolymer of Butadiene and Styrene' was also started in 1974. This programme, in which more than 10 laboratories all over the world, are participating, is coordinated by A. K. VAN DERVEGT and A. GHYSELS (Shell Plastics Laboratorium, Delft).

Working Party on Molecular Characterization of Commercial Polymers

After the report presented in Leyden (1972) it appeared that the absolute measurements on molecular parameters were quite scattered, especially for polyethylene. Therefore, a Working Party was established to study this polymer and try to obtain comparable results in the laboratories of the different participants. The first task was to obtain good values for molecular

weights and to establish a correct relationship between this quantity and the viscosity index. For this purpose a series of narrow fractions was prepared by one of the participants starting from a high density polyethylene and distributed to all the participants. The agreement was quite satisfactory, a report was presented at the Madrid Symposium on Macromolecules (1974) and will be published. Now this Working Party is trying to obtain correct values for the degree of branching on low density polyethylene. This is a difficult task: work is in progress and the participating 10 laboratories meet twice a year for a confrontation of their results.

Working Party on Supported Polymer Films

This Working Party was established in Munich (1973) as a successor of the Organic Coatings Section of Applied Chemistry Division. It had proceeded with its activities essentially to increase international cooperation and support to the scientific aspects of macromolecular surface coatings.

Three meetings have been organized, Garmisch, FRG, May 1974; Brussels, November 1974; Scarborough (UK). Many propositions of activities have been made but they have not yet been initiated. Two papers resulting from the analytical group of this Working Party have been published: 'Analysis of Thermosetting Acrylic Resins' in *Journal of Paint Technology*, p.46, 1974 and 'Gel Permeation Chromatography of Alkyd Resins' in *Journal of Chromatographic Science*, **12**, p. 59, 1974.

I would like to add that Working Parties are important and efficient not only for the results they obtain but also since they are the only place where people from different industrial laboratories can discuss freely and exchange information.

4 September 1975

H. BENOÎT
President, Macromolecular Division

V. ANALYTICAL CHEMISTRY DIVISION

Report of President

Financial limitations have imposed restrictions on the work of the Division but, by imposition of a very rigid control and thanks to the generosity of various bodies, meetings of the Division Executive Committee and some Members of Commissions V.1, V.3, V.4, and V.5 have been possible and representatives have been sent to meetings of FECS and ISO/TC 47. Nevertheless, since the XXVII IUPAC Conference 10 reports have been published in *Pure and Applied Chemistry* or as Additional Publications and another 5 are awaiting publication, 6 reports have been published as Appendices to the *Information Bulletin* and a further 9 are being considered by the Division Committee.

A large number of ISO Draft International Standards have been distributed for comment within the Division but a mechanism for IUPAC endorsement of ISO Standards has yet to be worked out in detail. A more positive collaboration with the Applied Chemistry Division has been initiated and will be strengthened at the Madrid Conference. An *ad hoc* Interdivisional Working Party on Data Flagging, a project initiated within the Division, has produced a fourth list and will present a report to the Bureau at the 28th IUPAC Conference (Madrid, 1975).

Commission V.1: Reactions and Reagents

The Commission has continued to be concerned primarily with the formulation, in collaboration with the Section on Food (VI.1), of analytical methods for control of food additives under the IUPAC-CEE contract. Some difficulties in communication with CEE have been experienced.

A report on redox indicators is being reviewed by the Division Committee and others on determination of amines and of carbonyl compounds, on compleximetric indicators, and on colorimetric and fluorimetric methods for steroids will be finalized at the Madrid Conference. Projects on acid-base indicators for nonaqueous titrimetry and on methods for determination of polyphenols are in progress.

Commission V.2: Microchemical Techniques and Trace Analysis

The change in emphasis of the work of the Commission from organic micro-analysis to trace analysis has continued. There is now only one micro-analytical

project, on the analysis of organoboron compounds, and this is progressing well. Reports on the analysis of fluorine and of carbon, hydrogen, and nitrogen in organic compounds are being processed.

The Commission is working on trace analysis under two main headings. Under the first 'Trace Analysis Applicable to Determination of Minor Impurities in Chemicals', the first report has been published and two others are being reviewed by the Division Committee. A fourth study, on analytical reagents, is in progress and will summarize the views of about 600 laboratories. The first report in the series 'General Aspects of Trace Analytical Methods' is in press and a second, on preconcentration, is with the Division Committee. Other aspects of trace analysis under study include standard reference materials, contamination, analysis of surfaces, stability of standard solutions, losses by volatility, and decomposition of biological samples.

Reports: Trace Analysis Applicable to Determination of Minor Impurities in Chemicals-I. General Survey: *Pure Appl. Chem.* 37, 481 (1974)
General Aspects of Trace Analytical Methods-I. Methods of Calibration in Trace Analysis: *Pure Appl. Chem.* 41 (3) (1975), in press

Commission V.3: Analytical Nomenclature

Four reports have been published in *Pure and Applied Chemistry* and 3 as Appendices to the *Information Bulletin* (see below). A further report, on synonyms and trivial names, is ready for publication. Draft reports being considered by the Commission deal with publication of papers on gravimetric and ion-selective electrode procedures, with liquid-liquid extraction, and with scales of working. Work is proceeding on a compendium of analytical nomenclature—a most important project—and on nomenclature of kinetic methods of analysis. Projects on sampling, data processing, and information storage and retrieval are in abeyance. Considerable controversy has arisen over the Commission's proposals for usage of the terms 'equivalent' and 'normal'.

Reports: Recommendations for Nomenclature of Thermal Analysis: *Pure Appl. Chem.* 37, 439 (1974)
Recommendations for Nomenclature of Chromatography: *Pure Appl. Chem.* 37, 445 (1974)
Recommendations for Nomenclature of Contamination Phenomena in Precipitation from Aqueous Solutions: *Pure Appl. Chem.*

37, 463 (1974)

Recommendations for Nomenclature of Mass Spectrometry: *Pure Appl. Chem.* 37, 469 (1974)

Appendices to the *Information Bulletin*—

No. 36 Recommendations on Usage of the Terms 'Equivalent' and 'Normal' (August 1974)

No. 43 Recommendations for Nomenclature of Ion-Selective Electrodes (January 1975)

No. 44 Recommendations for Publication of Papers on Molecular Absorption Spectrophotometry in Solution between 200 and 800 nm (January 1975)

Commission V.4: Spectrochemical and Other Optical Procedures for Analysis

Commission V.4 is continuing to work on a series of nomenclature reports under the heading 'Nomenclature, Symbols, Units, and their Usage in Spectrochemical Analysis'. As a result of comments on the tentative version, the report on data interpretation has been revised and submitted for Division Committee approval. Work on analytical X-ray spectroscopy and on classification of excitation sources is at an advanced stage. Preliminary work on molecular fluorescence spectroscopy has been done.

Commission V.5: Electroanalytical Chemistry

A major part of the Commission's activity has been concerned with nomenclature and standards. One report has been published in *Pure and Applied Chemistry* and 3 as Appendices to the *Information Bulletin*; one has reached the Division Committee approval stage. A further project, on symbols and terminology, is making good progress.

The Commission's concern with solvents and electrolytes has continued. One report has been published and another has had Division approval. Projects are in being on other solvents and electrolytes. Other projects under study include halfwave potentials in dimethylformamide, propylene carbonate, and hexamethylphosphoramide; conditional diffusion coefficients; ionization constants of carboxylic acids; diffusion coefficients in mercury. Work continues on pretreatment of solid electrodes, indicator and reference electrodes in nonaqueous solvents, and the selectivity of ion-selective electrodes. The utility of electroanalytical methods in environmental analysis

is being studied.

Reports: An Approach to Conventional Scales of Ionic Activity for Standardization of Ion-selective Electrodes: *Pure Appl. Chem.* 37, 573 (1974)

N-Methylpropionamide as an Electrolytic Solvent. Purification and Properties: *Pure Appl. Chem.* 37, 579 (1974)

Appendices to the *Information Bulletin*—

No. 34 Proposed Terminology and Symbol for Transfer of Solutes from One Solvent to Another (August 1974)

No. 35 Status of the Faraday Constant as an Analytical Standard (August 1974)

No. 42 Recommendations for Sign Conventions and Plotting of Electrochemical Data (January 1975)

Commission V.6: Equilibrium Data

There is a very real danger that the increasing costs of compiling and publishing data will seriously affect the output of Commission V.6. Already the Division has had to request a reduction in activity on one project because of shortage of funds. Nevertheless, work is proceeding on compilation of data on stability constants of metal complexes involving organic and inorganic ligands and completion for the next Supplement to *Stability Constants* is expected by the end of 1975. A draft compilation of pK values of organic acids in aqueous solution is well under way. The first parts of a series on equilibrium constants of liquid-liquid extractants have been published and two other parts are with the Division Committee for approval.

A project on critical surveys of solution equilibrium constants is progressing well. The first reports are being circulated for Division Committee approval and others are in preparation within the Commission. Considerable progress has been made in the preliminary organizational stages of the solubility data project; four topics have been clearly defined and another four tentatively defined. However, funding for the project is causing concern. Reports on standard ionic media and symbols for mixed ligand complexes will be considered at the 28th IUPAC Conference.

Reports: Equilibrium Constants of Liquid-liquid Distribution Reactions—Introduction and Part I. Organophosphorus Extractants; and Part II. Alkylammonium Salt Extractants: Butterworths, 1974

Critical Evaluation of Some Equilibrium Constants involving
Organophosphorus Extractants: Butterworths, 1974

**Commission V.7: Analytical Radiochemistry and Nuclear
Materials**

The Commission continues its interest in reference materials for trace analysis by radiochemical methods and for uranium analysis in low-grade ores. Studies are in progress on nuclear methods of analysis for key elements (Cd, As, Se) and molecular compounds in environmental pollution, for fissile and fertile elements, and on nonnuclear methods for fissile and fertile elements. It is hoped that the Commission will approve an expanded report on radio-analytical nomenclature at the Madrid Conference. A critical compilation of radioanalytical data and a report on charged-particle-induced X-ray fluorescence are nearing completion.

Report: High Energy Photon Activation: *Pure Appl. Chem.* **37**, 249 (1974)

9 June 1975

N. TANAKA
President, Analytical Chemistry Division

VI. APPLIED CHEMISTRY DIVISION

Report of President

Following the XXVII IUPAC Conference (Munich, 1973), the Applied Chemistry Division has given detailed consideration to the mechanism for reorganization of its Sections and Commissions into Commissions and sub-committees as envisaged in the proposed changes of IUPAC Statutes and Bylaws and to the diversification of its programme. A full report on the latter aspect was presented to the Bureau in 1974 [*Information Bulletin* No. 48 (October 1974), pp. 62-66] and is now being discussed in the light of further proposals currently under consideration by the Bureau for the formation of a new Division of Health and Environmental Chemistry.

The Membership of the Division is made up from the Members of the Division Committee and those of the six Section Committees (Food, Fermentation, Air Quality, Pesticides, Oils and Fats, and Water Quality) and their Commissions. The work of the Division is conducted through these bodies.

The main item considered at the Division Committee meeting at Bedford in 1974 was management of the Division programme by means of formal projects and reviews. A scheme for the selection, evaluation, and review of projects has been prepared and it will be discussed by the Division Committee at Madrid in September 1975 with a view to immediate implementation. The Applied Chemistry Division is unique in having Sections rather than Commissions: the Committee has made preparation for the work of the Division to be reorganized into Commissions, in line with the revised Statutes and Bylaws to be presented to Council at Madrid. It has looked at the question of diversification of the Division programme, with special reference to environmental and analytical matters and to the questions of reclamation of solid wastes. Problems of nomenclature (including trivial names) of industrial chemicals have also been discussed.

The Sections of the Division have met during 1974-5, as follows:

Food—Warsaw, July 1974 [see *Information Bulletin* No. 49 (March 1975), pp. 35-47]

Fermentation—Vienna, July 1974 [see *Information Bulletin* No. 48 (October 1974), pp. 66-78]

Oils and Fats—Warsaw, August 1974 [see *Information Bulletin* No. 49 (March 1975), pp. 54-57]

Air Quality—Paris, September 1974 [see *Information Bulletin* No. 49 (March

1975), pp. 71-74]

Pesticides—Bracknell, October 1974 (*Information Bulletin* No. 50, in preparation)

Water Quality—Brussels, July 1974

The 1974 report of the Division, describing the programme of the Sections and their Commissions, was published in *Information Bulletin* No. 48 (October 1974), pp. 15-21.

Section VI.1: Food

The work of the Food Section is marked by increased liaison with international agencies requiring expertise in the area of chemistry. Close contact has been made with FAO-WHO and special meetings jointly between IUPAC and IUFOST have been arranged to discuss purity requirements for food additives. The Section has also cooperated closely with the Fermentation Section on guidelines for single cell proteins and with the UN Protein Advisory Group on protein methods for cereal breeders and single kernel analysis. Items discussed in the context of diversification include (1) Rapid Methods of Analysis, (2) Purity Requirements for Food Additives, and (3) Meat Quality Factors; and progress has been made as regards items (2) and (3). Future symposia planned include the III Symposium on Mycotoxins in Food and a Symposium on Advances in Smoking of Food in collaboration with the Polish Academy of Science. Contacts exist with other Sections within the Applied Chemistry Division, especially those on Oils and Fats, on Fermentation, on Pesticides, and on Water Quality; with other bodies of IUPAC, particularly the Coordinating Committee on Analytical Methods for CEE and IARC, the Commission on Analytical Reactions and Reagents, as well as the Section on Medicinal Chemistry; and finally with organizations outside the Union: IUFOST, FAO, WHO, ISO, and PAG.

The Commission on Food Additives (VI.1.1) is surveying methods for the detection of antioxidants in foods and an earlier report on the estimation of food additives in food is being updated with special reference to individual antioxidants. There is a collaborative study on the estimation of nitrosamines in food and on methods for polycyclic aromatic hydrocarbon profile analysis of high-protein foods, oils and fats. A survey on analytical methods for synthetic and artificial sweeteners has been initiated. Work on the determination of nitrite and nitrate in meat has progressed only slowly: other problems have included asbestos in talcs, silicates used in food, the specification for carrageenan and 'nitrosatable' amines in foods. Other studies relate to

heterocyclic carcinogenic substances in foods and to vinyl chloride in foods from food packaging materials.

The Commission on Food Contaminants (VI.1.2), in collaboration with FAO and WHO, has given special attention to the important field of mycotoxins in food. It has also revised the IUPAC methods for determination of mercury, lead, and cadmium in foods. Copper, selenium, and fluorine are also under consideration. Other items being discussed include purity specifications for single cell proteins and the use of animal wastes for feedstuffs.

Section VI.2: Fermentation

The Section on Fermentation is active in organizing symposia, notably the V (Berlin, 28 June-3 July 1976) and VI International Fermentation Symposia (1980), and it works in close cooperation with the International Association of Cereal Chemists in developing standard methods of analysis. Work on microbiological aspects of sewage and water purification has led to close cooperation with the Water Quality Section. The Section had considered requirements for education in biochemical engineering. Also, it has been particularly involved in developing standards for single cell proteins of microbial origin for the UN Protein Advisory Group and has prepared a glossary of biochemical engineering terms and symbols used for the fermentation industry. The recommended specifications for SCP [Technical Report Appendix No. 12 (August 1974) to the *Information Bulletin*] are general in character. Because of the diversity of SCP products expected in the future as a result of the use of various types of raw material and microorganism, these and standards for yeast quality, the microbiological possibilities of energy production to augment fossil fuel supplies and the microbiological conversion of solid wastes to useful products seem to be areas worthy of further attention.

Section VI.3: Oils and Fats

The Section on Oils and Fats has continued the revision and modernization of the compendium of standard methods for the analysis of oils and fats. Its current work programme includes methods for determination of lower fatty acids and/or the fatty acid composition of butter-fat by gas liquid chromatography; determination of trans-unsaturated components in oils, fats, fatty acids, and fatty acid methyl esters by infrared spectrophotometry; measurement of the melting range of fats; and determination of the total oxidized fatty acids, tocopherols, and pesticide residues. There is also a

substantial future programme, including the identification and determination of emulsifying agents used in the food industry. The Commission on Soaps and Oleochemicals (VI.3.2) will be looking at methods for the analysis of glycerine and soaps; determination of *cis-cis* linoleic acid in oils and fats by an enzymatic method; and determination of the oil contents of seeds by low-resolution NMR.

Section VI.4: Air Quality

The Section on Air Quality is concerned with methods for the determination of potentially hazardous substances in air, including metals and airborne sulfate particles or acidic aerosols. Its relationship with the Commission on Toxicology of the Clinical Chemistry Section has been discussed, but progress in implementation of the agreed division of work has not been satisfactory. There has also been little progress in programme diversification and a new approach to the whole subject of air quality within IUPAC now seems to be desirable.

Section VI.5: Pesticides

The Section on Pesticides arranged the successful III International Pesticide Chemistry Congress in Helsinki during 3-9 July 1974. The Section and its Commissions on Terminal Pesticide Residues and Residue Analysis continue to work in their respective fields, in direct response to the needs of international agencies, particularly FAO and WHO. The Commission on Pesticide Residue Analysis (VI.5.2) is concerned specifically with critical evaluation and assessment of residue analytical procedures for many individual pesticides and their metabolites of interest to the international agencies and the influence of post-harvest practice on the fate and amount of residues in food and feed. The Commission on Terminal Pesticide Residues (VI.5.1) is similarly concerned with assessment and evaluation of knowledge on the nature of terminal residues of organochlorine, organophosphorus, and carbamate insecticides, fumigants, fungicides, and herbicides in food and forage, including the influence of climate on these and their nature and extent in food moving in commerce.

Section VI.6: Water Quality

The main activity of the Section has been the organization of the II International Congress on Industrial Waste Water and Wastes (Stockholm, 4-7

February 1975) for which 70 papers were selected for presentation out of a total of about 150 submitted. There has been further discussion with the Fermentation Section on the proposed symposium on Microbiological Aspects of Effluent Treatment, but this has had to be postponed on account of financial difficulties. The Section has taken part in the work of ISO Technical Committee 147 on Water Quality, through its Associate Member Dr. P. O. BETHGE and is taking steps to deal with matters raised by this work. Other projects in progress include pollution abatement in industry and participation in the COWAR programme of ICSU, and those under discussion include microbiological aspects of effluent treatment and education and nomenclature in water chemistry.

Division Programme

Diversification of the programme into eight Commissions as discussed by the Bureau in 1974 and based on Air Quality, Fermentation, Food Additives, Food Contaminants, Oils and Fats, Pesticide Residue Analysis, Terminal Pesticide Residues, and Water Quality has been in progress during 1975. The whole of the present programme has been set out in terms of individual projects and a system for evaluating them (and where necessary determining priorities) by the Division Committee. The activity of the Air Quality Section apart, the overall programme is closely geared to international problems of applied chemistry and is independent of but integrated with the corresponding programmes (where these exist) of other international bodies. Many of the programmes are analytical or environmental (or both) in character, so that the recent proposal for the formation within IUPAC of a Health and Environmental Chemistry Division is of particular interest to the Applied Chemistry Division.

The reorientation of the Division from a Section basis to a Commission basis, could be completed by 1977. There will be special need for coordination of the two new Commissions on Food, and for those on Pesticides, within the Division. The process might be taken a stage further by the inclusion of much of the present programme into the new Health and Environmental Chemistry Division, if this is formed, in which case the management of other work of an applied chemistry character will need to be considered carefully in relation to the programmes of the remaining Divisions of the Union. Should the formation of the new Division be approved, therefore, it is recommended that any part of the programme of the Applied Chemistry Division not so transferred should be the subject of special consideration

during the period 1975-7, with the view to identifying the best structure for the management of such work from 1977 onwards.

Although the Division has been in existence since 1949, there were many changes of Membership and particularly among the Officers in 1967, and a number of important changes in Membership are due in 1975. In this connexion, some difficulties arise because those who have served in the same titular position for eight consecutive years are not eligible for reappointment except with the specific authorization of the Bureau. In order to avoid the special difficulty which a change in key Membership would entail at a time of programme reorganization, the succession of Officers (if this is necessary) has where possible been selected, albeit on a short term basis, from Members with long service. This still entails, in some cases, the approval of the Bureau and a list of those for whom this special agreement is sought will be brought forward separately.

Special thanks are due to the Chairmen, Secretaries, and all other Members of the Sections and their Commissions for the careful regard to their financial commitments during the period 1973-5.

30 June 1975

H. EGAN
President

CLINICAL CHEMISTRY SECTION

Report of Chairman

The Members of the Section on Clinical Chemistry have been very active since the XXVII IUPAC Conference in Munich (1973) as a result of plans made at that event. Approval was given there by Council for the formation of the Commission on Toxicology and this body has now established itself firmly beside the three older Commissions of the Section.

A decision was made at the Section meeting in Munich to apply for Division status and this was done formally by the Chairman at the Bureau meeting in Brussels during 1974. The Bureau decided, however, not to reach a decision at that time and recommended that the matter be considered further by the Executive Committee early in 1975. One of the problems of the Section has been, of course, that no Bylaws are available for this kind of body, and therefore the Section has had to govern itself along Division lines. Although the draft revision of Statutes of the Union will eliminate this difficulty and place the Section in a better position within IUPAC, the Section Members still feel that clinical chemistry is a sufficiently large and unique discipline to warrant Division status. They therefore wish to have their application considered again by the Bureau at the 28th IUPAC Conference in Madrid. Because of the importance of the new Statutes to the Section the Chairman spent considerable time reviewing them and made several recommendations which were considered by the Bureau.

A major event during the period of this report was the meeting of the Section Officers at the time of the 1st European Congress of Clinical Chemistry (Munich, 21-26 April 1974). All four of the Commissions also held successful meetings in Munich. The Members of the newly-created Commission on Toxicology met for the first time and it became apparent at once that this would be an active and productive group. Because several Members of the Section were able to obtain funds from outside sources, this enabled all Members to attend their respective meetings except Prof. D. H. CURNOW (Australia). Also, a number of National Representatives were able to attend the meetings and to present different points of view and to learn about IUPAC procedure and the work of the Section.

A close relationship has been maintained with the International Federation of Clinical Chemistry (IFCC). Approval was given for the Section's Chairman (Dr. D. B. TONKS) and Secretary (Dr. M. ROTH) to represent IUPAC on the Executive Board of IFCC, where they sit as nonvoting members.

Complimentary to this action, the President and Secretary of IFCC represent it at meetings of the Section. This arrangement has many advantages for the advancement of clinical chemistry. The Section has agreed to sponsor the very important IX International Congress of Clinical Chemistry, which is being organized by IFCC in Toronto during 13-18 July 1975. All details have been worked out satisfactorily for full IUPAC sponsorship. The proceedings of the Congress symposium on Reference Methods in Clinical Chemistry, to be held on 17 July, are to be published in *Pure and Applied Chemistry*; Dr. G. N. BOWERS and Dr. J. P. CALI (USA) are the Cochairmen for this event. Dr. TONKS will represent IUPAC at the opening ceremony of the Congress and Profs. T. P. WHITEHEAD and M. RUBIN will give keynote addresses. A number of ancillary meetings will be held before and during the Congress and almost all of our Section Members will be involved either in them or the main event.

Dr. ROTH attended the IFCC Executive Board meetings of January 1974 and of April 1975 at Geneva, and also the November 1974 meeting at Harrow. Dr. TONKS also attended the latter meeting and both Officers will meet with the IFCC Executive Board in Toronto (10-11 July 1975). One of the important matters which has been discussed many times at these meetings is the problem of quantities and units in enzymology as presently given in the now official IUPAC Recommendations 1973. These have not yet been accepted by the Expert Panel on Enzymes of IFCC, which has in fact made other proposals. A vote will be taken to settle the controversy at the IFCC Council meeting on 12 July in Toronto. Thus the matter will be finally settled democratically, it is hoped, by the National Representatives to IFCC.

Members of the Section have participated in a number of WHO meetings and events. Prof. RUBIN and Dr. B. H. ARMBRECHT shared the task of representing IUPAC at the 1974 Session of the WHO Regional Committee for the Americas in Washington, DC (24 September-5 October 1974). Profs. RUBIN, WHITEHEAD, and Prof. P. LOUS were invited to participate in a Consultation on the Standardization of Diagnostic Methods and Materials (Geneva, 11-16 November 1974). Dr. ROTH represented IUPAC at the WHO Study Group on Early Detection of Health Impairment in Occupational Exposure to Health Hazards (Geneva, 10-16 December 1974). Also, he acted as a WHO temporary adviser to the Consultation on Standardization in Clinical Chemistry (Geneva, 25-28 February 1975) at which Prof. LOUS, Prof. WHITEHEAD, and Dr. R. GRÄSBECK were present. The report from this meeting summarizes beautifully the problems and aims of clinical

chemistry, and it will form a basis for much of the work on standardization which will be done in this field for many years to come. Prof. R. BOURDON represented IUPAC at the WHO Task Force on Environmental Health Criteria for Lead (Geneva, 29 April-5 May 1975). Prof. LOUS again participated in organizing of the Advanced WHO Course (the fifth one) in Clinical Chemistry held in Copenhagen during 1974, and also accompanied Dr. W. FERREIRA of WHO on a trip to several Asian countries to visit previous participants in the Advanced Course and to assess future needs. All of these participations in WHO activities show that the Members of the Section are taking their rightful places, as experts in clinical chemistry, in the deliberations at an international level which have as a basic aim the improvement of medical care throughout the world. This is also the basic aim of the Section, working through chemistry. WHO, at its World Assembly in 1974, committed itself to increasing its activities related to the Standardization of Diagnostic Methods and Materials (Resolution WHA 27.62) and this will have important ramifications for clinical chemistry.

Dr. R. DYBKAER attended, as an Observer, two meetings of the IUPAC-IUB Commission on Biochemical Nomenclature (Santiago de Compostela, 3-6 May 1974; Dorking, 9-12 June 1974). Although funds were lacking to cover Dr. DYBKAER'S expenses for the 1975 meeting, the Chairman decided that he must attend this important event even though it meant drawing in advance on 1976 funds.

Comments having been requested from within the Union regarding Prof. M. L. McGLASHAN'S proposals for reorganizing the Interdivisional Committee on Nomenclature and Symbols (IDCNS), the Section Officers and its Commission Chairmen were invited by Dr. TONKS to express their views. The consensus was that some action was necessary to improve the effectiveness of IDCNS and that quantities and units should be separated from nomenclature. However, it was considered essential for the Section to maintain its own Commission on Quantities and Units, which still had a great deal of specialized work to do.

This report would not be complete without mentioning the matter of finance, which occupied much of the Chairman's time during the period in question. Even though considerable help was obtained from outside of IUPAC, there was insufficient money available to cover adequately all of the planned, essential activities. Therefore, the Section has been forced to draw on funds which will be allocated for 1976. It is hoped that this will not restrict the scope of the Section's activities in that year, and thereby dampen

the enthusiasm of the Members. The Section will, however, try to be more cautious with its planning in future and make allowances for inflation, principally sudden increases in travel costs. Nevertheless, approval of a realistic budget for the Section's future activities is earnestly requested.

A meeting of the Section Officers and Commission Chairmen will be held, at no expense to IUPAC, in Toronto during the week of the Toronto Congress and final plans will be formulated for the meetings to be held in Madrid at the 28th IUPAC Conference. An open discussion on finance has been called for. The Commission on Toxicology will also hold a full meeting in Toronto, again at no expense to IUPAC, at which final plans will be made for the International Symposium on Clinical Chemistry and Chemical Toxicology of Metals.

Commission on Automation

At its meeting in Munich during April 1974, the Commission finalized the document 'Recommendations Concerning the Ideal Attributes of Instruments Intended for Automated Analysis in Clinical Chemistry'. It was submitted subsequently to the Secretariat to obtain approval for publication as a provisional IUPAC document, which should have important influence on automatic instrument design.

Work has begun on a second document concerned with the evaluation of automatic equipment used in clinical chemistry. There is an urgent need for such a document and a clarification of the terminology used in such evaluations. It will have wide implications in analytical chemistry. No document of this type has been prepared with international agreement.

Commission on Quantities and Units

An intense activity has been possible over the past 2 years because of financial support provided both by IUPAC and IFCC, which enabled meetings to be held in Munich (April 1974), Giessen (September 1974), and Wageningen (March 1975).

Much time has been devoted to drafting recommendations on quantities and units in clinical chemistry for optical spectroscopy. Part 1 on 'General Kinds of Quantity' is almost ready for publication as provisional rules and recommendations by IUPAC and IFCC. Considerable progress has also been made with other documents in this series: molecular spectrometry of liquid and solid systems; molecular and atomic emission and absorption

spectrometry in physicochemical plasma; specifications for spectrometers.

Other areas of current work include a document on kinds of quantities concerned with transport of components with time and collection of material on pH, 'activity', etc., and on viscosity, shear rates, shear stress, etc. The question of quantities and units in enzymology has been discussed extensively due to the different positions maintained by the Commission, the IUPAC-IUB Commission on Biochemical Nomenclature, the IFCC Committee on Standards, Expert Panel on Enzymes, and individuals.

Commission Members have had a number of contacts with national and international organizations answering questions, commenting on publications and explaining the IUPAC Recommendations 1973: 'Quantities and Units in Clinical Chemistry' and 'List of Quantities in Clinical Chemistry' [*Pure Appl. Chem.* 37, 517 and 547 (1974)]. The implementation has proceeded through the smooth collaboration with IFCC, which has distributed reprints of documents and laboratory sheets using the recommended system to a large number of organizations and individuals.

The system of kinds of quantities, units, and quantity names advocated by the Commission seems to gain acceptance. Netherlands and Finland have implemented it several years ago, Denmark mainly in 1973, and UK and Australia in 1974. Sweden (and possibly Norway) plan to start in 1976 and the necessary preparatory work with education of the different health groups has started in Austria, Federal Republic of Germany, France, and Switzerland.

Commission on Teaching

The Commission has completed its first major effort of providing a survey of the worldwide status of clinical chemistry together with guidelines and recommendations on education and training for the future. It is now starting to produce curricula which can be implemented in conjunction with the teaching of chemistry in order to prepare university chemistry specialists for careers in clinical chemistry. Likewise, it has decided on its third effort which will be directed towards the needs of chemistry specialists at the technician level of education and training.

Commission on Toxicology

The first meeting of the Commission was held in Munich on 19-20 April 1974, at the time of the 1st European Congress of Clinical Chemistry. The following documents were produced: Activity Report; Statement of Scope

and Terms of Reference; Proposal for an International Symposium on Clinical Chemistry and Chemical Toxicology of Lead; Budget Proposal.

A special meeting of the Commission was held in London on 19-20 February 1975, in order to proceed with detailed planning for the conference which was now to be entitled International Symposium on Clinical Chemistry and Chemical Toxicology of Metals, and which is to be held in Europe in September or October 1976. The goals, scope, organization, and preliminary programme for the Symposium were drafted and plans were submitted to the IUPAC Executive Committee. Approval for sponsorship by the Union of the Symposium was formally given by this body at its Moscow meeting early in 1975 and also a financial subvention was granted to be applied against any deficit which might occur.

The Commission on Toxicology plans to have another special meeting in Toronto on 16 July 1975, in order to decide on the exact dates, location, and hotel accommodation for the Symposium, as well as the plans for publication of the proceedings. Other activities of the Commission have included formal interactions (a) with the IUPAC Section on Air Quality (Dr. S. S. BROWN attended its meeting in Paris on 25-27 September 1974; and Dr. TONKS met with Dr. H. EGAN, President of the Applied Chemistry Division, in Ottawa on 31 May 1975, to discuss the relative roles of the two bodies); and (b) with the WHO Task Force on Environmental Health Criteria for Lead (Prof. R. BOURDON attended a meeting at Geneva in April 1975).

Discussions are in progress regarding the possibility of jointly sponsoring a Symposium on Gas Chromatography/Mass Spectrometry of Drugs and Toxic Agents in Body Fluids as one of the sessions on 'Chemistry and Welfare of the Human Being', which is being planned for the 26th IUPAC Congress in Tokyo during September 1977.

Contacts have been made through the President of the Union, Sir HAROLD THOMPSON, with IUPHAR, regarding possible collaboration in an inter-Union symposium on the mechanism of drug action to be held in 1976.

D. B. TONKS

Chairman, Clinical Chemistry Section

21 June 1975

COMMITTEE ON TEACHING OF CHEMISTRY

Report to Council

Composition of Committee

Towards the end of 1973, Prof. R. W. PARRY (USA) tendered his resignation as Chairman of the Committee, having served in that capacity for several years and the Executive Committee in 1974 invited Prof. C. N. R. RAO (India) to succeed him.

Four Foundation Members of the Committee, Dr. J. A. CAMPBELL (USA), Prof. M. OKI (Japan), Prof. G. M. SCHWAB (Federal Republic of Germany), and Dr. P. SYKES (UK), completed their term of duty during the biennium and were replaced by Prof. G. ILLUMINATI (Italy), Prof. M. LAFFITTE (France), and Prof. D. VITOROVIĆ (Yugoslavia), who had previously served as National Representatives, and Dr. H. HELLMANN (Federal Republic of Germany). Also, Prof. A. F. PLATÉ (USSR) was replaced on the Committee by Prof. I. V. BEREZIN (USSR).

Activities

A. *International Meetings*

International Congress on Improvement of Chemical Education, sponsored by UNESCO in collaboration with the IUPAC Committee on Teaching of Chemistry was held in Wrocław, Poland, in September 1973. This Congress, which is one of a series of international conferences on science education held with UNESCO support, provided a review of trends in chemical education at various levels. The proceedings, based on a number of commissioned papers, are available in the UNESCO *New Trends in Chemical Education* series.

Madrid Symposium. A Symposium is being organized by the Committee on 6-7 September 1975 in Madrid at the time of the 28th IUPAC Conference. The topic is 'Educational Technology in Teaching of Chemistry'. This Symposium is being followed by another on 'Chemical Education in Europe', organized by FECS.

B. *Newsletter*

A major development for chemical education has been the publication of an *International Newsletter on Chemical Education* edited by Prof. RAO. The

first issue appeared in November 1974 and the second in June 1975. Distribution of the Newsletter, which has received financial support from UNESCO, has been mainly through the National Representatives of the Committee and the National Adhering Organizations. The aim is to provide information on chemical education developments in various countries and to disseminate news on the international activities of the Committee and on regional programmes such as 'Chemical Education in Europe'. It is hoped that the Newsletter will soon become a forum for exchange of ideas and promotion of desirable changes in chemical education.

C. Publications

As a result of discussions between the Committee and the Atomic Weights Commission during the XXVII IUPAC Conference at Munich in August 1973, a simplified four-figure atomic weights table has been prepared and approved by the Committee and is now available in published form (June issue of Newsletter).

D. Laboratory Workshops in Chemistry at University Level

A contract was signed with UNESCO in December 1974 to provide consultancy services for a regional laboratory workshop in general chemistry at university level to be held in South-East Asia (venue subsequently agreed as Seoul, Republic of Korea). The consultant selected, Dr. D. J. WADDINGTON (UK), will be participating in the workshop in August 1975. The goal is the design and testing of an introductory laboratory course in chemistry appropriate for universities in developing countries.

A workshop on a similar topic, 'Laboratory Instruction in Chemistry', but not instigated by UNESCO, was held at Troy, New York in June 1974. This workshop received IUPAC sponsorship.

Relations with Other Bodies

In addition to informal discussions with the Committee on Teaching in Clinical Chemistry and other IUPAC Commissions interested in aspects of chemical education, the Committee through its National Representatives, submitted comments to the ICSU Committee on Teaching of Science for a Seminar on 'Integration, Coordination or Separation of Sciences at University Level', held in May 1974 at Paris. The report of the Seminar is now available from the IUPAC and ICSU Secretariats.

Collaboration with FECS in chemical education has been made possible

by the direct involvement of the Committee's National Representatives in many European countries in the work of FECS, particularly in relation to the survey of chemical education in Europe currently being undertaken.

C. N. R. RAO

19 June 1975

Chairman, Committee on Teaching of Chemistry

COMMITTEE ON PUBLICATIONS

Report to Council

During the past 2 years, the Committee on Publications has had to face some major problems. The income from royalties has decreased, for the first time in recent years, and this has been a most efficient stimulus to review several points in the publication policy. As a result of a series of meetings of the Committee or of part of its membership, it has been concluded that the contract with our publisher should be revised, and that a new contract should be prepared after tendering among major international publishers. It has finally been decided to propose that, beginning on 1 January 1976, Pergamon Press should be appointed as the new official publisher of IUPAC.

The new contract which will be signed after the IUPAC Conference in Madrid, will enable the Union to obtain a guaranteed minimum income of \$40,000 per annum and the technical arrangements prepared with the new publisher should give IUPAC publications a wider distribution. A higher royalty (13%) and a lower proposed selling price are also important advantages.

The discussions with the various publishers will also help the Committee to study a revision of the system of publications of IUPAC, to streamline it towards better filling present needs. In this study, the Committee will continue a process initiated already under the Chairmanship of Sir HAROLD THOMPSON.

The publications of the Union have experienced technical problems associated in part with the move of Butterworths from London into Kent. Authors were also partly responsible for some delays, and the combined outcome is that the first issues of 1975 volumes of the journal *Pure and Applied Chemistry* have only recently gone to press.

The Committee has also started discussions on various new forms of publication, such as miniprinting, use of microforms, synopsis journals, etc. These will provide a basis for future policies.

G. OURISSON

Chairman, Committee on Publications

21 July 1975

MINUTES OF 28th COUNCIL MEETING

9 and 11 September 1975

Present: Prof. Sir HAROLD THOMPSON (President, in the Chair), Members of Bureau, Delegates of National Adhering Organizations, Observers of Associated Organizations.

All statutory actions necessary for convening a meeting of Council had been taken through the following letters:

- re.* Official invitation to National Adhering Organizations, 75.01.07 (17/RR/JG/75)
- re.* Official invitation to Associated Organizations, 75.01.07 (16/RR/JG/75)
- re.* Members of IUPAC Bodies, 74.12.31 (1107/RR/JG/74)
- re.* Nomination of Candidates for Elections (Officers and Bureau) and Items for Council Agenda, 75.01.30 (WG)
- re.* Council Agenda, 75.05.09 (602/MW/SP/75)
- re.* Announcement of Candidates for Elections (Officers and Bureau) and Documentation available for Council Agenda Items, 75.07.17 (819/MW/SR/75)

Minute 1 Introductory Remarks and Finalization of Agenda

In his opening remarks, Sir HAROLD THOMPSON expressed thanks to the Spanish colleagues, especially Consejo Superior de Investigaciones Científicas, for the invitation for the Union to meet in Madrid and all the help provided to facilitate the Conference, including the financial support of the Ministry of Education.

The Council stood in silence for a short period in remembrance of the colleagues deceased since the last Conference: E. D. BERGMANN, N. F. BRIGHT, H. J. BUNKER, P. R. L. A. DALQ, E. C. DODDS, Th. FÖRSTER, H. HURTIG, E. R. LIPPINCOTT, A. C. MENZIES, R. T. O'CONNOR, H. REMY, E. K. RIDEAL, B. RIEGEL, R. ROBINSON, E. E. SMISSMAN, C. L. WILSON.

Minute 2 Approval of Minutes of XXVII Council Meeting

The Minutes of the previous Council Meeting, as circulated to the National Adhering Organizations and as printed on pages

60-75 of *Comptes Rendus XXVII Conference: Part B*, were approved by the National Delegations.

Minute 3 Announcement of Nominations for Officers and Bureau Members

The files for the Meeting contained the nominations received by the statutory deadline, together with biographical notes on each candidate, for vacancies amongst the Officers and Elected Members of the Bureau. Sir HAROLD THOMPSON announced that the nomination of Prof. O. GLEMSER for the Office of Vice-President had been withdrawn.

On the recommendation of the Bureau [Minute 4/75, 34th Bureau (Madrid)] it was *Resolved* that:

- (i) there be 12 Elected Members of the Bureau for the period 1975-7 (Statute 7.2);
- (ii) the procedure for election of Elected Members of the Bureau be that adopted at Cortina d'Ampezzo (1969), Washington (1971), and Munich (1973).

Council noted that in accordance with Bylaw 2.222, the Bureau had made an additional nomination of Dr. O. ISLER (Switzerland) as an Elected Member of the Bureau and recommendations for filling the 6 vacancies as Elected Members of the Bureau [Minute 4/75, 34th Bureau (Madrid)]. The proposal of the President, that Sir DAVID MARTIN (UK), Prof. G. OURISSON (France), and Dr. W. SPINDEL (USA), be appointed as Tellers for the duration of the Meeting, was accepted.

Minute 4 Announcement of Time of Elections

The President announced that the elections would be held at 10.00 on 11 September.

Minute 5 Statutory Report of President on State of Union

Sir HAROLD THOMPSON referred to his printed report which had been precirculated, emphasizing

- the need to improve interdivisional communications had been considered by the Bureau at Madrid
- recommendations of terms of reference and membership for future operation of the Interdivisional Committee on Nomenclature and Symbols had been approved by the Bureau at Madrid

- if the neutral group of experts was unable to make definite recommendations to the Bureau in 1976 of names for elements 104 and 105, then IUPAC might have to act independently and present its own recommendations
- the Executive Committee had agreed that the Company Associates might, in due course, have an *ex officio* Member on the Bureau
- the Bureau had decided to set up a small *ad hoc* Committee to look, in detail, into the proposal for a Division of Health and Environmental Chemistry, but there would still be a need to retain suitable applied chemistry working programmes in a separate Division
- Butterworths had been served with notice of termination of the present publishing contract at the end of 1975, and a form of contract agreed with Pergamon Press for appointment as official publisher to the Union from the beginning of 1976
- the Bureau at Madrid had reaffirmed the stand of IUPAC against political pressures for the expulsion from membership of Republic of China (Taiwan)
- the Bureau at Madrid had reaffirmed the adherence of the Union to the principle of freedom for attendance of *bona fide* chemists at IUPAC-sponsored meetings and to the mechanism approved at Brussels in 1974 for withdrawal of sponsorship

The report was received with acclamation.

Minute 6 Biennial Report of Treasurer

The report of the Treasurer and the audited accounts for 1973-4 had been circulated before the Meeting in printed form. In 1973 there was an excess of income over expenditure of \$26,605.23, and the excess in 1974 was \$97,347.01. However, the position for 1975 was poorer. Because of inflation and additional costs he expected the final expenditure on the Madrid Conference to be about \$200,000 (cf. budget of \$175,000). The Union might have to consider the restructuring of its biennial Conference if costs continued to rise in the present manner. Prof. HORN regretted that there had been insufficient funds available, particularly in

1974, to facilitate the work of the Divisions.

As of 75.09.09, there were outstanding national subscriptions of \$18,700 for 1975, with an additional \$6,900 still unpaid from earlier years. Unless Belgium, Brazil, Chile, Mexico, and Nigeria paid their 1974 subscriptions before the end of this year, under revised Statute 9.2 (see Minute 16/75), they would automatically cease to be Members of the Union. Also, Argentina, Austria, Colombia, India, Poland, Portugal, Republic of Vietnam, and Yugoslavia, who had not yet paid for 1975, would incur severe penalties if the position was not remedied by the start of 1976. Consideration was being given to the introduction of a 10% surcharge for member countries who did not pay their annual subscriptions before 31 December.

Sir HAROLD THOMPSON thanked the Treasurer for the care he had shown in handling the financial affairs of the Union. Council *Resolved*:

that the Treasurer's biennial report and the audited accounts for 1973-4 be adopted.

On the recommendation of Prof. HORN, Council also *Resolved*:

that Neutra Treuhand AG be reappointed as auditor for IUPAC for the biennium 1975-6.

Minute 7 Report of Finance Committee

The Chairman, Dr. J. W. BARRETT, said that a main purpose of the Finance Committee was to find means of increasing the income of the Union. He was, therefore, pleased to note the good response from National Adhering Organizations to the higher subscriptions approved by Council at Munich. The Finance Committee had made an analysis of the present membership Categories in terms of the 1972 national chemical turnovers (based on OECD official figures). Changes of Category were now appropriate for a number of countries. The requests for changes at Madrid by Arab Republic of Egypt and USSR (Minute 9/75) were, therefore, welcome and Dr. BARRETT hoped that others would be made voluntarily during the next biennium. As a result of the impetus given through formation of the International Company Associates Group and the several National Groups, he

looked forward to more income in the future from Company Associate subscriptions. The move in 1975 to a separate formal financial account for publications was emphasized. In addition to the retiring members of the Finance Committee mentioned in the report to Council, the resignation of Dr. E. M. BEAVERS (USA) had recently been received.

Minute 8 Tentative Budgets for 1976 and 1977

Prof. HORN said that the concern of the President to increase substantially the money made available for the scientific programmes of the Union, had been met by raising the general contingency fund in 1976 from \$5,000 to \$30,000 to cover new and extended activities. Sir HAROLD THOMPSON also felt that it might be necessary to spend more than the \$10,000 budgetted for contributions to Symposia. Although there was a deficit of \$9,500 on the Publications Budget, there was an excess of income over expenditure of \$19,500 on the General Purposes Budget (as of 75.09.06). The general financial forecast for 1977-8 indicated a large deficit for that biennium. However, the Treasurer had no great fears for the future because IUPAC had reasonable financial reserves.

The UK Delegation complimented the Treasurer and Finance Committee on their work and the good status of the finances of the Union. Council *Resolved*:

that the tentative budget for 1976 and the general financial forecast for 1977-8 (as of 75.09.06) be accepted.

Minute 9 Dues Structure and Fixing Annual Dues for 1976 and 1977

Council *Resolved* with acclamation:

that the requests from Arab Republic of Egypt to transfer from Category C to B1 and from USSR to transfer from Category A1 to A2 be approved.

The President emphasized that the increase in voting power from 2 to 4 for Arab Republic or Egypt would only become operative after the Council Meeting on 11 September [see Minute 455, LXV Executive Committee (Cortina d'Ampezzo)]. Also, he mentioned that the national subscription to the Union from Nigeria was outstanding from 1972 onwards. Council accepted

the proposal of the Science Association of Nigeria to let Statute 9.2 run its full course: Nigeria would be 4 years in arrears at the end of 1975 and cease to be a Member of IUPAC.

The provisions made in revised Statute 9.2 (see Minute 16/75) to improve the payment of national subscriptions were noted. On the recommendation of Prof. HORN, Council *Resolved*:

that the minimum annual subscriptions for the various membership Categories, approved by Council in Munich, be maintained for the biennium 1976-7.

Minute 10 Applications for Associated Organization Status

On the recommendation of the Bureau [Minute 5.1/74, 33rd Bureau Meeting (Brussels); Minute 4/75, page 3, 34th Bureau Meeting (Madrid)], it was *Resolved* on a show of hands:

that applications for Associated Organization status of the Union be approved from

Association of Editors of European Chemistry Journals
Groupe pour l'Avancement des Méthodes Spectroscopiques
et Physico-Chimiques d'Analysis

International Association for Water Pollution Research
International Committee of the Science of Photography
International Confederation for Thermal Analysis
International Organization for Crystal Growth

The President said that, in general, the Bureau had been well satisfied with the short statement of current activities submitted by the Existing Associated Organizations. At his recommendation Council *Resolved* on a show of hands:

that the 14 independent bodies already enjoying the status of Associated Organization of IUPAC be allowed to continue in that capacity for the next biennium.

Minute 11 Reports of Division Presidents and Clinical Chemistry Section

The Division Presidents and the Chairman of the Clinical Chemistry Section referred briefly to their precirculated reports of activity since the XXVII Conference, then informed Council of the further progress made during the 28th Conference.

Dr. R. N. JONES said that much of the activity of the Physical Chemistry Division currently centred on problems of symbols,

units, terminology, and nomenclature. Just prior to the Conference the revised *Manual of Symbols and Terminology for Physicochemical Quantities and Units* had been published by Butterworths. Discussions with the International Company Associates Group at Madrid concerning the thermodynamic tables project at Imperial College London had proved fruitful and might lead to closer links with chemical industry. Plasma chemistry represented an expanding area within the Division which would need new financial support. The proliferation of acronyms in spectroscopy had received attention at Madrid and would probably be broadened into other fields of physical chemistry during the next biennium. IUPAC had waived its rights of publication of the student textbook *Physical Chemistry: Enriching Topics from Colloid and Surface Chemistry*, and publication had been undertaken privately by the Officers of the Commission on Colloid and Surface Chemistry.

Prof. V. GUTMANN reported the formation of a subcommittee on Assessment of Isotopic Composition to abstract and evaluate such data for all the elements in their normal occurrence. Interim recommendations of isotopic composition from mass spectrometric data must now be harmonized with other data and made completely consistent with the definite Table of Atomic Weights. This most important work would require new financial support from the Union. Money was also needed for wide distribution of reprints of the biennial report of the Commission on Atomic Weights. Owing to financial stringencies, circulation of the 1973 Report had fallen short of the intent to seek wide comment by interested manufacturers and the chemical public on possible labelling of well-characterized chemicals to avoid error from false or inadvertent use of isotopically altered chemicals. Although the term 'atomic weight' was being retained, 'relative atomic mass' was now confirmed as equivalent in meaning and of equal acceptability. A proposed modification by the Bureau of the Inorganic Nomenclature Commission's suggested systematic naming of elements 106 and following, might enable a firm recommendation to be brought before Council in 1977. The report of the *ad hoc* Committee on Nuclear and Radiochemistry was unsatisfactory to the Inorganic Chemistry Division

Committee, which was making suggestions for further study so that the *ad hoc* Committee could report back to the Bureau in 1976.

In the absence of Prof. A. KJAER, Prof. H. ZOLLINGER reiterated that a major concern of the Organic Chemistry Division Committee was the organization and sponsorship of various regular series of symposia. Symposia in some new areas might soon be started. He emphasized that the duration of life of a Commission was supposed to be limited (Bylaw 4.1301), and the Division hoped to fulfil this requirement in the next 2 or 4 years in respect of the Commission on Physical Organic Chemistry. Also, the Division was happy to retain the Section on Medicinal Chemistry rather than for this body to be transferred elsewhere within the Union.

Prof. H. BENOIT apologized for failing to provide an activity report on the Macromolecular Division for circulation prior to the Conference. His report was received by the Executive Secretary only on 4 September. He had finally made recommendations to the Bureau in Madrid for the Titular Membership of the Commission on Polymer Characterization and Properties established by Council at Munich. The purpose of the Commission was to coordinate the activities of the existing Working Parties of the Division and to suggest the creation of new Working Parties in fields where this was thought to be necessary. Financial support would be needed in 1976 for its inaugural meeting.

Prof. N. TANAKA said that the five sets of nomenclature recommendations being brought before Council for approval in Madrid (Minute 18/75), illustrated the continuing efforts of the Analytical Chemistry Division to encourage standardized usage amongst practising analytical chemists. Money would be needed for the four relevant Commissions to meet in 1976 to sustain these efforts. Progress on the stability constants and solubility data projects was hampered by lack of funds, both for data compilation and for provision of camera-ready copy for direct printing. Financial support was also needed to support the collaborative work of the Division on the CEE contract and for the extended checking of ISO International Standards requested by the Bureau.

Dr. H. EGAN reported that a comprehensive compilation of

the existing work programmes of the Applied Chemistry Division had been assembled. Attention was being paid to diversification of these programmes, with special reference to the interests of industry and the International Company Associates Group. Difficulties were foreseen for the Division in respect of the revised Statutes and Bylaws (Minute 16/75), but it would work towards their implementation during the period 1975-7. The current programmes of the Air Quality Section were insufficiently independent of other international programmes to recommend continuation of its activities beyond the Madrid Conference. Steps had been taken to bring recommendations on a diversified programme before the Division Committee, with a view to reactivating the Section prior to the 1977 Conference. The Bureau had requested the Division to consider, in detail, the implications for the Union of the problem of standardization of trivial names for chemical substances.

Dr. D. B. TONKS reported that the International Symposium on Clinical Chemistry and Chemical Toxicology of Toxic Metals, being organized by the Commission on Toxicology, had been deferred until early in 1977. There had been insufficient funds provided in recent years for proper functioning of the Clinical Chemistry Section and its Commissions. Financial support was needed in 1976 in particular for a planned meeting of various experts on quantities and units in spectroscopy. The revised Statutes and Bylaws would greatly facilitate the future working of the Section.

Council Resolved:

- (i) that changes in atomic weight value for barium, cadmium, fluorine, molybdenum, potassium, and silicon, recommended by the Commission on Atomic Weights during the 28th Conference, be accepted;
- (ii) that, on the recommendation of the Bureau in Madrid, the word 'organic' be dropped from the title of the Commission on Organic Photochemistry, and that its membership be extended to include experts from inorganic, physical, macromolecular, and biochemical photochemistry.

Minute 12 Report of Committee on Teaching of Chemistry

The printed report of the Committee on Teaching of Chemistry

was included in the Council file. The Chairman, Prof. C. N. R. RAO, said that programmes were now being planned on the basis of the important recommendations made at the 1973 UNESCO-IUPAC International Congress on Improvement of Chemical Education held in Wrocław. He hoped that the proceedings of the Madrid Symposium on Educational Technology in Teaching of Chemistry could be published at the end of the year.

Regarding the future programmes of the Committee, a contract was envisaged with UNESCO for preparation of an Anthology of Chemical Education (1974-5). A joint Working Group was being set up with the International Company Associates Group to conduct a survey of the status of continuing chemical education in industry. A joint Working Group was being formed with the Commission on Teaching of Clinical Chemistry to work out a curriculum, etc., for the field. The scope of the *International Newsletter on Chemical Education* was being re-examined with a view to improvement of the contents and circulation. The possibility of having a further International Conference on Chemical Education in collaboration with UNESCO was being examined. Financial support from the Union would be needed for some of these programmes as well as for the day-to-day work of the Committee.

The President was pleased to note the reactivation of the Committee on Teaching of Chemistry under the Chairmanship of Prof. RAO, and he agreed that IUPAC must not rely entirely on UNESCO to finance the work of the Committee. Prof. G. OURISSON said that the Committee on Publications would be pleased to discuss ways of wider circulation for the Newsletter.

Minute 13 Report of Committee on Publications

The Chairman of the Committee on Publications, Prof. OURISSON, reiterated the main points from his printed report in the file for the meeting. He anticipated that discussions between the Committee and Pergamon Press, the new official publisher to the Union, would lead to the evolution of a more rational system of IUPAC publications and means of promoting IUPAC work through its publications. A replacement would be needed from the end of 1975 for Prof. B. C. L. WEEDON, who

was resigning after some 15 years as Scientific Editor of the Union.

The President said that, should Prof. OURISSON become the next Secretary General of the Union, the Executive Committee wishes him to continue as Chairman of the Committee on Publications for a further year while Pergamon Press assumed the publishing responsibilities of IUPAC. In answer to a question about the possibility of simultaneous publication in *Pure and Applied Chemistry* and another journal, Sir HAROLD THOMPSON said this would depend on the circumstances. However, no immediate change was envisaged in present IUPAC publications policy.

Minute 14 Location of Official Headquarters for 1975-9

Council Resolved (Statute 4.3):

that the Official Headquarters of the Union continue to be located in the Canton of Zurich for the next 4 years.

Minute 15 Language for Official Records during 1975-9

Council Resolved (Statute 5.405):

that the Language for Official Records of the Union continue to be English for the next 4 years.

Minute 16 Adoption of Revised Statutes and Bylaws

The Chairman of the Committee on Statutes and Bylaws, Sir DAVID MARTIN, said that preparation of the revised Statutes and Bylaws had been conducted through widespread consultation and much correspondence, keeping in close touch throughout with the President, Executive Committee and Bureau of the Union, Division Presidents and Secretaries. His Committee had tried to improve the organizational structure of the Union and at the same time to introduce a considerable measure of flexibility.

Sections, as defined in existing Statute 10.4, had been removed as constituent parts of Divisions, but where Sections already existed they could be redesignated as Commissions without loss of operational effectiveness. Where 'Section' was used in the revised Statutes, it referred to a body with similar character to a Division but attached directly to the Bureau, e.g. the Clinical Chemistry Section. This arrangement provided the

Bureau with a statutory mechanism for encouraging new growth areas of chemistry and new interdisciplinary fields between chemistry and other disciplines. Also, it provided for Divisional status to be achieved through gradual evolutionary development.

The abolition of statutory Sub-Commissions was proposed because the existing requirements were too restrictive. The new flexibility allowed Divisions more autonomy in the control and direction of their scientific programmes, especially in relation to new and active subject areas. Divisions, under Divisional Rules, could now set up subcommittees, this generic name being intended to embrace task groups, working parties, project groups, etc.

The President asked Council to accept the revised Statutes and Bylaws without amendment at this time or to defer the matter for reconsideration prior to the 1977 Conference: any changes of a substantive nature would be difficult to accommodate at this late date due to the complex inter-relationship among most of the Statutes and Bylaws. However, Council should permit the Bureau to exercise care over the next 2 years in implementation of the revision. Sir HAROLD THOMPSON noted that the approval of two-thirds (108) of the total number of votes (161) assigned to the Adhering Organizations of the Union were needed to change the 1965 Statutes and Bylaws (Statute 13.3). In answer to a question raised by the Hungarian delegation, it was agreed to continue the present serial numbers for 'Conference' when these were known as 'General Assemblies'.

It was *Resolved* on a card vote (132 in favour; 0 against; 0 abstentions):

that the revised Statutes and Bylaws be adopted.

Minute 17 Proposals Formally Received from National Bodies

17.1 Office of Secretary General

The Delegation from Federal Republic of Germany said that the 13 member societies of Deutscher Zentralausschuss für Chemie had agreed unanimously to ask Council to abolish the Office of Secretary General of IUPAC by the time the period of Office of the present Secretary General ended.

Sir HAROLD THOMPSON said that the Secretary General was charged specifically with the administration of the

Secretariat (Statute 6.41) and was needed for immediate advice to the President on various matters. From his personal experience of IUPAC affairs over recent years, Prof. BÉNARD was firmly against the proposal: he referred particularly to his letter (of 75.03.20) in the Council file. Dr. CAIRNS pointed out the advantage to the Secretariat should the President be from outside Europe, if a Secretary General existed and was resident in Europe. Sir HAROLD THOMPSON reported that the Executive Committee [Minute 21/75, page 4, 83rd Meeting (Madrid)] and Bureau [Minute 4/75, page 4, 34th Meeting (Madrid)], were not in favour of the proposal.

On being put to a card vote, the proposal was defeated (10 in favour; 116 against; 4 abstentions).

17.2 *Period of Office of Treasurer*

As agreed at Munich (Minute 16/73, XXVII Council), the National Adhering Organizations had been invited to submit their views in writing on the proposal from Federal Republic of Germany, that the period of Office of Treasurer should be amended to begin on 1 January of the year following his election at an IUPAC Conference and end on 31 December of the year of the Conference at which his successor as Treasurer was elected. As at 74.04.26, 20 countries were in favour of the proposal, 4 were against, and no reply had been received from the other 20 countries.

The President pointed out that revised Statute 4.2 enabled Council to vary the period of Office of the Treasurer, but the Bureau had made no recommendation on the matter. After a brief debate involving the delegations from Federal Republic of Germany, UK, and USA, Council *Resolved* on a card vote (122 in favour; 10 against; 4 abstentions):

that the period of Office of the Treasurer elected in Madrid be extended to 31 December 1979.

17.3 *Chemical Research Applied to World Needs (CHEMRAWN)*

Following discussion at Munich of its Statement on 'Opportunities for International Cooperation through IUPAC' (Minute 23.1/73, XXVII Council), the US National Committee for IUPAC had defined its ideas more clearly in the CHEMRAWN document. After stating the purpose of CHEMRAWN, six

activities were proposed to achieve these aims. Based on these considerations, the following main topics were identified:

- (i) Natural Resources, Raw Materials, Energy, and Chemical Intermediate Supply
- (ii) Chemistry in Agriculture: Chemistry's Role in World Food Supply
- (iii) Chemistry in the Quality of Life
- (iv) Worker Health Protection in the Chemical Industry

Subtopics were identified under each of the four main headings.

Sir HAROLD THOMPSON said that the general subject of world agriculture needs would probably be taken up by ICSU at its General Committee meeting in Schloss Laxenbourg later in the month. Dr. BARRETT and Dr. W. STOLL pointed out that the International Company Associates Group (ICAG) had independently envisaged some of the topics listed by CHEMRAWN. Dr. TONKS suggested that chemistry of disease should be added to the topics listed in the US document. Also, he thought the word 'Worker' might advantageously be deleted from topic (iv). Although the Applied Chemistry Division was already active on a number of the subtopics, Dr. EGAN supported the CHEMRAWN proposals. Support was also forthcoming from the Arab Republic of Egypt, Indian, Polish and Spanish Delegations to Council. Dr. D. BEHRENS recommended that close collaboration be maintained in any CHEMRAWN activity with the European Federation of Chemical Engineering, which had similar ideas.

The President agreed to convene a small *ad hoc* meeting on 10 September to consider what actions might be taken by the Union. Subsequently, he reported back to Council that:

- (i) The Union could allocate some money for a limited CHEMRAWN initiative from that set aside for new and extended activities in the 1976 IUPAC Budget.
- (ii) Preliminary to any full-scale effort, it would be necessary to identify explicitly those topics in the CHEMRAWN document which were to have priority.
- (iii) Any full-scale effort would need financial support from outside the Union and the employment of appropriate professional staff in addition to the IUPAC Secretariat.

Meanwhile, the Secretariat would collect relevant information from the National Adhering Organizations and Divisions for consideration at a meeting of the *ad hoc* Working Group in London on 76.01.10. The proposal for a Division of Health and Environmental Chemistry should be deferred until the CHEMRAWN study had progressed.

Minute 18 Adoption of Nomenclature Rules

The meeting file contained a list of provisional recommendations on nomenclature, symbols, units, and standards which had been approved by correspondence through the Executive Committee since the XXVII Conference (Appendices Nos. 34 -44 to the *Information Bulletin*). These provisional recommendations were ratified by Council.

On the proposal of the relevant Division President, the following recommendations on nomenclature, symbols, terminology, and conventions were adopted by Council:

Physical Chemistry Division (Dr. JONES)

- (i) Nomenclature and Conventions for Reporting Mössbauer Spectroscopic Data (Commission on Molecular Structure and Spectroscopy) (Tentative Nomenclature Appendix No. 33, August 1973, to *Inf. Bull.*)
- (ii) Recommendations for Nomenclature and Spectral Presentation in Chemical Electron Spectroscopy Resulting from Excitation by Photons (Commission on Molecular Structure and Spectroscopy) (Provisional Nomenclature Appendix No. 37, August 1974, to *Inf. Bull.*)
- (iii) Recommendations for Presentation of NMR Data for Publication in Chemical Journals—B. Conventions Relating to Spectra from Other Nuclei (Commission on Molecular Structure and Spectroscopy) (Provisional Nomenclature Appendix No. 38, August 1974, to *Inf. Bull.*)
- (iv) Definitions, Terminology, and Symbols in Colloid and Surface Chemistry—II. Heterogeneous Catalysis (Commission on Colloid and Surface Chemistry) (Provisional Nomenclature Appendix No. 39, August 1974, to *Inf. Bull.*)

Organic Chemistry Division (Prof. ZOLLINGER)

- (i) Nomenclature of Iron-Sulfur Proteins (IUPAC-IUB

Commission on Biochemical Nomenclature) (Tentative Nomenclature Appendix No. 32, August 1973, to *Inf. Bull.*)

- (ii) Nomenclature of Corrinoids (IUPAC-IUB Commission on Biochemical Nomenclature) (Provisional Nomenclature Appendix No. 40, August 1974, to *Inf. Bull.*)

Macromolecular Division (Prof. BENOÎT)

Nomenclature of Regular Single-strand Organic Polymers (Commission on Macromolecular Nomenclature) (Tentative Nomenclature Appendix No. 29, November 1972, to *Inf. Bull.*)

Analytical Chemistry Division (Prof. TANAKA)

- (i) Nomenclature, Symbols, Units, and Their Usage in Spectrochemical Analysis—II. Terms and Symbols Related to Analytical Functions and Their Figures of Merit (Commission on Spectrochemical and Other Optical Procedures for Analysis) (Tentative Nomenclature Appendix No. 26, November 1972, to *Inf. Bull.*)
- (ii) Classification and Nomenclature of Electroanalytical Techniques (Commission on Electroanalytical Chemistry) (Tentative Nomenclature Appendix No. 30, August 1973, to *Inf. Bull.*)
- (iii) Status of Faraday Constant as an Analytical Standard (Commission on Electroanalytical Chemistry) (Provisional Nomenclature Appendix No. 35, August 1974, to *Inf. Bull.*)
- (iv) Recommendations for Sign Conventions and Plotting of Electrochemical Data (Commission on Electroanalytical Chemistry) (Provisional Nomenclature Appendix No. 42, January 1975, to *Inf. Bull.*)
- (v) Recommendations for Nomenclature of Ion-selective Electrodes (Commission on Analytical Nomenclature) (Provisional Nomenclature Appendix No. 43, January 1975, to *Inf. Bull.*)

Minute 19 Proposals for New Bodies and Dissolution of Existing Bodies

Following the recommendations of the Bureau, which had been distributed to all Delegates, Council *Resolved*:

- (i) to accept the proposal from Federal Republic of Germany and Switzerland that, having completed the revision of the 1965 Statutes and Bylaws, the Committee on Statutes and Bylaws be dissolved [Minute 4/75, page 4, 34th Bureau Meeting (Madrid)].
- (ii) that, on the advice of the *ad hoc* Committee appointed by Council [Minute 18 (vii), XXVI Meeting (Washington)], a Commission on Reclamation of Solid Wastes be established and attached to the Applied Chemistry Division, with 8 Titular Members, of whom two should be S. J. Pirt (UK) and A. E. Humphrey (USA), the others to be proposed by the President of the Division [Minute 6/75, 34th Bureau (Madrid)].
- (iii) that all existing Commissions of the Union be allowed to continue for the next 2 years (Bylaw 4.1302) [Minute 4/75, page 4, 34th Bureau (Madrid)].

Minute 20 Ratification of Decisions Taken by Bureau and Executive Committee Since XXVII Conference

All decisions taken by the two bodies since those approved by Council at Munich (Minute 19/73, XXVII Meeting), were contained in the Minutes of the XXXI–33rd Bureau and LXXVI–82nd Executive Committee Meetings. These Minutes had been circulated to all National Adhering Organizations.

Council Resolved:

that the decisions taken by the Bureau and Executive Committee since the XXVII Conference be ratified.

The President drew the attention of Council to the following matters which had received the attention of the Bureau and Executive Committee at Madrid:

- (i) The increasing relationship of IUPAC with WHO and similar international organizations was placing an additional financial burden on the Union. WHO would be approached about the possibility of contacting IUPAC to provide expert advice in future.
- (ii) A 3-year trial period of operation had been agreed for the scheme to involve younger chemists in the affairs of the Union. A mechanism for nomination of

candidates from UK had been elaborated. Sir HAROLD THOMPSON looked forward to similar initiatives in other member countries.

Minute 21 Elections

The following elections of Officers made by the Divisions were approved by Council (Bylaw 4.105):

Physical Chemistry Division

President (1973-1977):	Dr. R. N. JONES
Vice-President (1973-1977):	Prof. S. SUNNER
Secretary (1973-1977):	Prof. M. FAYARD
[Past-President (1973-1977):	Dr. G. WADDINGTON]

Inorganic Chemistry Division

President (1975-1977):	Prof. L. MALATESTA
Vice-President (1975-1979):	Prof. N. N. GREENWOOD
Secretary (1973-1977):	Prof. A. A. VLČEK
[Past-President (1975-1977):	Prof. V. GUTMANN]

Organic Chemistry Division

President (1975-1977):	Prof. H. ZOLLINGER
Vice-President (1975-1977):	Prof. P. YATES
Secretary (1975-1977):	Prof. S. ITÔ
[Past-President (1975-1977):	Prof. A. KJAER]

Macromolecular Division

President (1975-1977):	Prof. C. G. OVERBERGER
Vice-President (1975-1977):	Prof. V. KABANOV
Secretary (1975-1977):	Dr. A. J. DE VRIES
[Past-President (1975-1977):	Prof. H. BENOÎT]

Analytical Chemistry Division

President (1973-1977):	Prof. N. TANAKA
Vice-President (1975-1977):	Prof. T. S. WEST
Secretary (1975-1979):	Dr. J. C. WHITE

Applied Chemistry Division

President (1973-1977):	Dr. H. EGAN
Vice-President and	
President-Elect (1973-1977):	Prof. H. SUOMALAINEN
Vice-President (1973-1977):	Dr. W. G. STOLL
Secretary (1973-1977):	Dr. A. J. COLLINGS

Present:

33 Delegations with a total of 136 votes.

Vice President:

In a written and secret ballot for Prof. G. SMETS

132 in favour

0 against

0 abstentions

1 spoiled ballot paper

Total voting 136, simple majority 69.

Prof. SMETS was declared the elected Vice-President, the result being greeted with acclamation by Council.

Secretary General (Prof. OURISSON did not act as a Teller)

In a written and secret ballot for Prof. G. OURISSON

136 in favour

0 against

0 abstentions

Prof. OURISSON was declared the elected Secretary General.

Treasurer:

In a written and secret ballot for Prof. O. HORN

136 in favour

0 against

0 abstentions

Prof. HORN was declared the elected Treasurer.

Elected Members to Bureau:

Sir HAROLD THOMPSON asked the Executive Secretary to read out a letter (dated 75.09.10), in which Dr. CH. RESNICK regretted that, because of urgent personal matters, no members of the Israeli Delegation could be present at Council during the election of Elected Members to the Bureau. They had followed very closely the great interest expressed by Chemists of Arab Republic of Egypt in becoming more active in IUPAC activities. It seemed to them that the candidacy of Prof. A. ABOU-EL-AZM was, hopefully, a manifestation of the central principle on which the Union operated and thrived, namely that science knew no national boundaries and that political considerations played no role whatsoever in efforts to create better understanding among

people through scientists. On behalf of the Israeli Delegation, Dr. RESNICK welcomed Prof. ABOU-EL-AZM's candidacy as a great opportunity for the fullest international cooperation in science through IUPAC.

In a written and secret ballot (see Minute 3/75) for 6 vacancies

Prof. N. M. EMANUEL	134
Dr. O. ISLER	129
Prof. S. NAGAKURA	124
Prof. A. PEREZ-MASIÁ	122
Dr. M. A. CRIVELLI	118
Prof. A. ABOU-EL-AZM	103
Dr. W. GALLAY	74

Total voting 816, simple majority 69.

The 6 vacancies were declared to be filled by Prof. ABOU-EL-AZM, Dr. CRIVELLI, Prof. EMANUEL, Dr. ISLER, Prof. NAGAKURA, and Prof. PEREZ-MASIÁ.

Minute 22 Ratification of Dates and Place of 29th Conference and 26th Congress

22.1 29th IUPAC Conference

In addition to the earlier invitation from Israel (74.12.24), a formal invitation had recently been received for the Conference to be in Poland (75.07.30). Possible locations in Poland were Gdansk, Krakow, Poznan, or Warsaw.

On the proposal of the Austrian Delegation, seconded by Arab Republic of Egypt, Council *Resolved* on a card vote (124 in favour; 0 against; 10 abstentions):

that the 29th Conference (General Assembly) of IUPAC be held in Poland in 1977, the exact location and dates to be fixed by the Bureau in conjunction with the Polish National Committee for Chemistry.

There was general agreement that there should be as little separation as possible between the dates for the Conference and the 26th Congress.

22.2 26th IUPAC Congress

Council *Ratified*:

that the 26th Congress of IUPAC should be held in Tokyo during the period 4-10 September 1977.

The President reported some concern that the overall scope of the programme for the Congress might become too extensive and that there might be difficulties in obtaining entry visas from some countries. These aspects would be watched closely by the Bureau [Minute 4/75, page 5, 34th Bureau (Madrid)].

Minute 23 Place of 30th Conference and 27th Congress

23.1 30th IUPAC Conference

In response to a verbal invitation from the Swiss Delegation, Council *Resolved* on a card vote (120 in favour, 0 against, 6 abstentions):

that the 30th Conference (General Assembly) of IUPAC be held in Switzerland in 1979.

The suggestion of the UK Delegation that it would be useful to generate some rules as to how far ahead IUPAC should solicit invitations for its Conference and Congress, was referred by the President for the attention of the Bureau.

23.2 27th IUPAC Congress

A verbal invitation from the Finish Delegation for the 27th Congress of IUPAC to be held in Helsinki in 1979 was provisionally accepted by Council on a show of hands.

Minute 24 Any Other Business (Discussion Only)

In order that all important deliberations of the Bureau at Conference were drawn immediately to the attention of Council, Sir HAROLD THOMPSON suggested that the following item should be included on future agenda:

‘Important Matters Discussed by Bureau at Conference
Not Covered by Items on Council Agenda’

Votes of Thanks

On the proposal of the US Delegation, Council warmly extended to Sir HAROLD THOMPSON its sincere compliments with an expression of gratitude for his strong Presidency of the Union over the past biennium. He had not only maintained and extended the traditional strengths of IUPAC, but also demonstrated outstanding leadership in guiding the Union towards new activities in publications, communications, participation of younger

chemists, and international responsibility. Council wished him well in his many endeavours and hoped that he would continue to help the Union in the important role of Past-President. The UK Delegation asked that thanks be recorded to the retiring Secretary General for his work on behalf of IUPAC.

COMMITTEE ON PUBLICATIONS

2 September 1975

Present: Prof. G. OURISSON (Chairman), Dr. L. C. CROSS, Dr. H. GRÜNEWALD, Dr. R. L. KENYON, Prof. A. PEREZ-MASIÁ, Prof. B. C. L. WEEDON (Scientific Editor). In attendance: Mr. I. R. MAXWELL (in part) (Pergamon), Dr. M. WILLIAMS.

1. Introductory Remarks

As a result of suggestions from Members of potential candidates for membership of the Committee on Publications, Dr. K. BLÁHA (Czechoslovakia) had been appointed by the President. Unfortunately, Dr. BLÁHA had not been granted an exit visa from his home country to participate in the present meeting.

2. Minutes of Meeting in London (28 May 1974) and Matters Arising

The minutes of the previous meeting of the Committee on Publications (*Inf. Bull.* No. 48, October 1974, pp. 47-54) were approved.

The following matters arising from the minutes were considered further:

- (i) Although there had been insignificant sales in 1974 of the hardbound edition of *Enzyme Nomenclature 1972*, the paperback version had continued to sell well and the stock was nearly exhausted. The royalty for 1974 from Elsevier to IUPAC was Dutch Guilders 1,324.85 (\$552.02).
- (ii) Dr. GRÜNEWALD repeated his offer to suggest improvements in the presentation of IUPAC news made available by the Secretariat for consideration of publication in national chemical journals. The next release would be sent for comment by Dr. GRÜNEWALD prior to distribution.
- (iii) The Executive Secretary reported that an agreement had now been signed by the Institute for Scientific Information (ISI) and IUPAC in respect of royalties arising from the original article tear sheet service operated by ISI for *Pure and Applied Chemistry* (PAC). Arrangements should be made for the new official publisher to the Union to supply copies of PAC to ISI in 1976.

3. Interim Meetings in London (13 November 1974; 24 February 1975; 15 May 1975) and Matters Arising

The Chairman said that three interim meetings of the Committee on Publications had been convened as a consequence of the Bureau resolution to offer for tender the contract as official publisher to IUPAC [Minute 17.1 (iv)/74, 33rd Bureau (Brussels)]. Unfortunately, for financial reasons it had been necessary to limit participation in these meetings. Short reports prepared by the Executive Secretary on the first two meetings and a letter from Prof. OURISSON conveying the final recommendations from the third meeting to the President of the Union, had been circulated already to all Members of the Committee on Publications.

The following matters arising from the interim meetings were considered further:

- (i) Dr. CROSS confirmed that he would still provide the IUPAC Secretariat with a memorandum on microfiche production and especially the economic aspects thereof.
- (ii) It was noted that publication aspects of two existing IUPAC data compilation projects, *International Thermodynamic Tables of the Fluid State* and *Tables of Stability Constants*, were to be discussed with the new official publisher to the Union. The Executive Secretary drew attention also to the solubility data project within the Analytical Chemistry Division, from which Gmelin Institut had recently withdrawn as publisher: negotiations were now being conducted with Plenum Press. The Committee on Publications felt that any contract between the Commission on Equilibrium Data and Plenum should be signed by the President of IUPAC. However, although the solubility data project had originally been thought of as beyond the scope of the IUPAC publishing programme, the new official publisher to the Union might be interested to undertake the work under its contract with IUPAC.

4. Report of Committee on Publications to Council

The report to Council prepared by the Chairman, summarizing the work of the Committee on Publications during the past 2 years, was noted. Prof. OURISSON proposed to make a few remarks at the meeting of Council in Madrid about more recent developments in appointment of the new official publisher to the Union.

5. Matters Arising with Butterworths

(i) *1974 Sales and Royalties.* After deductions for purchases by IUPAC of £1,345.00, the net royalty paid to the Union for 1974 was £4,639.66 (cf. £9,724.48 for 1972 and £8,669.13 for 1973). The major decrease was in royalties from *Pure and Applied Chemistry* (PAC), because of late charging of subscriptions for 1975 to the journal. Some doubts were expressed within the Committee on Publications as to whether most of the previous subscribers would be recouped, especially when the charging was apparently still incomplete in mid-1975.

(ii) *Discontinuation of Symposia Offprints from PAC.* In the view of Butterworths, the demand for hardbound offprints of symposia material from PAC was inadequate to justify their continuation. Prof. OURISSON had proposed instead that, from the beginning of 1976, individual issues of PAC should be made available for sale. At the first of its recent interim meetings (1974.11.13) the Committee on Publications had reaffirmed its support for this change of policy. However, the Executive Committee had approved the suggestion of the President of the Union to defer consideration until the matter could be evaluated with the new official publisher to IUPAC.

(iii) *New Covers and Jackets.* The Executive Secretary reminded the Committee on Publications of its approval of proposals from Butterworths for a new system of covers and jackets for IUPAC hardbound publications. Unfortunately, during the move of office from London into Kent these proposals had been overlooked by Butterworths, and *all* hardbound material not previously published in PAC was being issued as "IUPAC Additional Publications". The Committee decided to leave the new official publisher to the Union to make its own suggestions for covers and jackets without any reference to the proposals of Butterworths.

6. Report of Scientific Editor and Status of Publishing Programme

In referring briefly to the latest IUPAC Publications Status Report (as of 22 August 1975), Prof. WEEDON pointed out that the last issue of PAC for 1974 had now been published. Although 8-10 months was an average time for publication of symposia lectures by the Union, for various reasons—not all attributable to Butterworths—we had recently fallen badly behind this time. However, all of the 1975 issues were at least being proofed out by the printer. Prof. WEEDON drew attention to the fact that all 1975 symposia

to be published in PAC during 1976, except for one meeting, occurred within a 3-month period this summer. Such a peak loading was typical of the annual IUPAC publishing schedule, and it could not be smoothed out by better use of Symposia Editors, etc.

Prof. WEEDON reiterated his wish, conveyed in a recent letter to the Chairman, to retire from Scientific Editorship to the Union at the end of 1975. Because of his appointment as the next Vice-Chancellor at University of Nottingham, he would be unable to give IUPAC publications the time and attention they required. His successor should be able to drop all his commitments for a few days in order to deal properly with batches of IUPAC material. The retirement of Prof. WEEDON was accepted with reluctance by the Committee on Publications.

It was impossible for one person to cover editorially the whole range of material to be published by the Union. Prof. WEEDON was an organic chemist, whereas the Assistant Scientific Editor, Prof. C. F. CULLIS, was a physical chemist. The introduction of Symposia Editors had also improved the situation and this concept should be developed further. One possibility, suggested as a technical device, might be to allow direct contact between the IUPAC publisher and Symposia Editors, although the Union would then inevitably lose some control exercised through its Scientific Editor.

The Committee on Publications envisaged that the duties of the Scientific Editor would remain largely unaltered during the next 2 years, after which any changes in the present range of IUPAC publications might become operative. It would be advisable to appoint as the new Scientific Editor a person who would not be intimidated by the new publisher to the Union. Prof. OURISSON was requested to suggest to the Executive Committee that he should negotiate with Prof. CULLIS regarding the post of Scientific Editor to IUPAC.

Prof. OURISSON said that, should he become the next Secretary General of IUPAC following the Council meeting in Madrid, it would be unwise for him to continue as Chairman of the Committee on Publications. Although Prof. WEEDON seemed to be the ideal person to succeed to the Chairmanship, this had to be discounted because of his changed circumstances next year.

7. Inclusion of Biographical Material in PAC

Prof. WEEDON said that it was a well-established policy of IUPAC not to permit inclusion of biographical or non-scientific (e.g. quotations) material

in papers published in PAC, nor to allow dedication of material to the memory of a deceased person. This policy had been rigorously implemented over the years by Prof. CULLIS and himself, but difficulties had arisen in connexion with the IX International Symposium on Chemistry of Natural Products (1974, Ottawa). If retained for the future, the policy would be more difficult to enforce should Symposia Editors be allowed to by-pass the Scientific Editor and be in direct contact with the publisher.

The Committee on Publications agreed to include the following wording in a revision of both 'Notes to Contributors' and 'Notes for IUPAC Officers and Organizers of Meetings':

'... text should be concise; nonscientific material is therefore not normally included. Biographical lectures or dedication of lectures is not acceptable.'

Another problem mentioned by Prof. WEEDON concerned a paper from the VII International Symposium on Carbohydrate Chemistry (1974, Bratislava), in which American spelling had been changed during editing to the British form without reference to the author who had complained. The Committee on Publications accepted the suggestion of Prof. OURISSON that both American and British forms of spelling be permitted in future for all IUPAC publications.

8. New Official Publisher to IUPAC for 1976 Onwards

The President of the Union had accepted the recommendation of the Committee on Publications that the present contract with Butterworths should be terminated and Pergamon Press appointed as official publisher to IUPAC from the end of the current year. Notice of termination had duly been served on Butterworths. A listing of points to be incorporated in the contract with Pergamon had been drawn up by the IUPAC Secretariat and discussed at a meeting between Sir HAROLD THOMPSON and Mr. I. R. MAXWELL in Oxford on 14 July 1975. The agreed points had subsequently been elaborated by the Executive Secretary into a draft contract, which had been examined and amended by solicitors in Oxford and the revised draft was tabled for consideration by the Committee on Publications. Some minor amendments were proposed and a few points noted for discussion with Mr. MAXWELL. Prof. OURISSON reminded the Committee that he had accepted by correspondence a change in format for PAC in 1976 from single-column/metric royal octavo to double-column *Tetrahedron* size. This would enable Pergamon to produce the journal more economically and had permitted the copy for

the first issue in 1976 to go for typesetting.

The Committee on Publications accepted Mr. MAXWELL's proposal that the reprint pricing system for *Tetrahedron* should apply to PAC. Mr. MAXWELL tabled an advance proof of some material to appear in the first Pergamon issue of PAC and asked for comments to be put to him in writing.

The following aspects of the contract were discussed in detail:

- (i) Clause 1—It was agreed that the initial period should be for 4 years, with 1-year periods of extension, termination to be by notice of 6 months prior to the end of any period.
- (ii) Clause 3—It was agreed that all new advertisements should be submitted by Pergamon to the Scientific Editor of the Union, who should have the right, within 30 days, to refuse publication.
- (iii) Clause 7—The subscription price agreed for PAC in 1976 was at the same exchange rate (3 US \$ = £1) as had been applicable with Butterworths since 1969, although this was now unrealistic. Concern was expressed when the Committee on Publications learned that, without reference to IUPAC, Pergamon had already invoiced all countries for 1976 with the exception of the sterling area and some "poor" countries at the US-\$ rate. Mr. MAXWELL was asked to check if it was still possible to retain for 1976 the Butterworths practice of billing in US-\$ those subscriptions placed in USA, otherwise many countries would suffer an approximate 50% rise in price. He agreed to provide IUPAC not later than June 1976 with a status report of subscriptions to PAC together with a recommendation for prices in 1977.
- (iv) Clause 16—In order to encourage organizers of IUPAC symposia in 1976 to arrange for preparation of plenary lectures in a form suitable for direct lithographic printing, laysheets and instructions (including translations into French and German) for such preparation should be distributed as soon as possible. The sum of \$2 per page would be paid for all material which was acceptable as camera-ready copy, including that retyped by authors/Scientific Editor/Secretariat, but excluding any retyping undertaken by Pergamon.

Mr. MAXWELL said that Pergamon planned to bring out a catalogue of all IUPAC publications for wide international dissemination (50,000 copies). Also, he suggested that journals associated with the National Adhering Organizations of the Union might advertise IUPAC publications, especially by granting priority for book reviews: Pergamon was willing to institute a

reciprocal arrangement via its own journals.

Prof. OURISSON mentioned two data compilation projects under the auspices of IUPAC—stability constants and solubility data—where negotiations were already in progress for publication outside the IUPAC contract. Mr. MAXWELL hoped that in future all IUPAC projects could be handled through Pergamon.

There was a brief discussion regarding the present range of publications of the Union. Mr. MAXWELL agreed that once Pergamon had become fully familiar with the various publications, it would suggest how they might be improved. Meanwhile, he promised to provide IUPAC with a report summarizing the views of some 300 chemists interviewed by Pergamon. Concerning the free provision by the Union of its provisional nomenclature recommendations, Mr. MAXWELL preferred all nomenclature recommendations to be issued in the form of a nomenclature journal. In any case, Dr. CROSS said it was now clear that a new approach was needed for solicitation of comments on nomenclature recommendations.

9. 1975 IUPAC Budget and Separate Publications Account

The Committee on Publications noted that the 1975 IUPAC Budget had been separated into a General Purposes Budget and a Publications Budget. It looked forward with interest to seeing the accounts for the year being assembled on the same basis.

10. Letter from Physical Chemistry Division

A letter was tabled from the President of the Physical Chemistry Division (1975.9.2), commenting on various aspects of the recently published *Manual of Symbols and Terminology for Physicochemical Quantities and Units* (2nd edition) and Vol. II of *Experimental Thermodynamics*. The Manual had not been published in PAC on the advice of the Commission on Physicochemical Symbols, Terminology and Units; its republication/translation through the National Adhering Organizations was permitted by the IUPAC publications contract. Omission of editors' names from the cover of *Experimental Thermodynamics* was an oversight by Butterworths rather than a policy matter of the Union.

11. Date and Place of Next Meeting

It was decided that the next meeting should be in Oxford for 2 days in the late spring or early summer of 1976, partly at the IUPAC Secretariat

and partly at Pergamon Press.

All Members of the Committee on Publications would be kept informed of developments with regard to the new official publisher during the next few critical months. Meanwhile, those Members still present in Madrid on 4 September agreed to meet to revise the new draft publishing contract in terms of decisions reached at the present meeting.

COORDINATING COMMITTEE FOR ANALYTICAL METHODS FOR CEE AND IARC

7 September 1975

Present: Prof. R. TRUHAUT (Chairman), Prof. F. PELLERIN (Secretary), Prof. R. BELCHER, Dr. H. EGAN, Dr. H. GUTHENBERG, Dr. E. O. HAENNI, Dr. K. KOJIMA, Dr. R. MARCUSE, Dr. P. L. SCHULLER, Prof. N. TANAKA.

1. Chairman's Report

In order to clarify the situation and to avoid any confusion on the part of Members of the Coordinating Committee, Prof. TRUHAUT systematically described the aims of CEE and the various principles or elements which governed the relations between IUPAC and CEE in the choice, establishment, and execution of contracts concerning methods for the analysis of food additives, in terms of the standards of purity established by CEE experts.

Three stages must be distinguished. In the first stage, it was up to the CEE authorities to establish a definitive list of products of a particular class whose addition to foods is acceptable. After agreement of its experts, the CEE had published in the *Official Community Journal*, the definitive lists of colorants, preservatives, antimicrobials and antioxidants whose addition to foods is allowed, specifying the conditions for their use. The CEE authorities were also responsible for establishing, on the advice of its experts, the standards of purity of various permitted additives, and to fix the limits of tolerable impurities. The standards of purity being fixed, the third stage was concerned with the choice of methods best adapted for the verification of fixed standards. At this stage CEE asked IUPAC to provide methods suitable by their specificity and their precision. Thus since 1966 a programme of cooperation had been established between IUPAC and CEE to provide control methods for food additives. Prof. TRUHAUT stressed that these procedures were different to those studied by IUPAC for the analysis of foods.

The contract had been renewed every year until 1974 and about 90 methods had been sent by IUPAC to CEE according to an established order. In 1975 CEE had not been able to establish a new contract. There were three reasons for this situation.

The programme of cooperation concerned with methods of analysis of colorants, antimicrobials, antioxidants, was almost finished. It had been

foreseen (Brussels, November 1971) that subsequent programmes would be concerned with new classes of food additive: thickeners, sweeteners, stabilizers, emulsifiers. At the present time, the first stage of the positive list of these compounds had been published by CEE. On the other hand, CEE had not yet been able to fix the standards of purity for the second stage of the list.

Also, the procedures prepared by IUPAC and sent to CEE must be approved by CEE experts before publication, and as yet they had only been able to study a small number of IUPAC's suggested procedures. Finally, the entry of other countries into the Common Market was another reason for the delays mentioned. Because of these reasons, CEE had not yet sent its comments to IUPAC on all the procedures received and had not been able to organize meetings between CEE and IUPAC experts. Prof. TRUHAUT, the Coordinating Committee, and its Liaison Group very much regretted this state of affairs, and had alerted the CEE authorities to it.

2. Current State of Procedures sent to CEE

Prof. Pellerin indicated that the cooperative programme established in 1966 and revised in Brussels (November 1971) and Amsterdam (January 1972) was almost ended with the dispatch of the procedures for the 1974 contract. Prof. PELLERIN pointed out that the dispatch of some procedures had been deferred, whether because they were awaiting details from CEE, or whether they needed further research by IUPAC experts who had not yet finished their work. Prof. PELLERIN recalled the list of those methods which appeared in the appendix to the minutes of the Liaison Group meeting in Birmingham on 8 May 1975, sent to all Members of the Coordinating Committee.

3. 1976 Contract

In view of the difficulties encountered with the organization of contracts, the dispatch of commentaries, and the joint study with CEE of outstanding technical problems, Prof. TRUHAUT welcomed with enthusiasm the suggestion made by the President, Sir HAROLD THOMPSON, to meet the CEE authorities to discuss the matter. They were received by Mr. BARTHELEMY, Joint Director of the Agricultural Board of CEE (Division VI.H.3), and Mr. GAERNER at Brussels, on 6 June 1975. The situation between IUPAC and CEE was clarified, and after a period of reflection, Mr. BARTHELEMY informed Prof. TRUHAUT that CEE agreed to establish a contract for 1976,

concerning a certain number of procedures. Meanwhile, the CEE representatives specified that all the procedures had been sent to its experts for critical examination and comment.

On 7 July 1975, Mr. BARTHELEMY sent Prof. TRUHAUT a memorandum in which he indicated that 14 procedures had been examined by CEE experts: 6 procedures were accepted, 3 were proven to be of no use (either outdated or imprecise), and 5 would be acceptable after modification.

At the beginning of August 1975, Prof. TRUHAUT received the list of procedures whose implementation must be carried out by IUPAC under the 1976 contract. Mr. BARTHELEMY indicated in his covering letter that the cycle of methods that the CEE must publish was finished for the moment (colorants, preservatives, and antioxidants). He said that only when other standards had been established for new classes of additive would it be possible to study the corresponding analytical procedure.

List of Methods for 1976 Contract

1. Determination of sulfuric acid (SO_3) in sulfurous acid (E 220)
2. Determination of organic chlorine in benzoic acid (E210)
3. Determination of organic chlorine in
sodium benzoate (E 211)
potassium benzoate (E 212)
calcium benzoate (E 213)
4. Determination of non-volatile substances in sulfurous acid (E 220)
5. Determination of 4-hydroxyanisol in butylhydroxyanisol (E 320 = BHA)
6. Description of the procedure for determining specific absorption (E 1%, 1 cm) in ethanol.

On this last point, Prof. TRUHAUT was instructed by the Coordinating Committee to ask for more detail from CEE.

4. Preparation of Methods

Much exchange of views went on between the Members present, and resulted in the following assessment:

Method 1. This method was at present under study in Prof. BELCHER's laboratory. Dr. GUTHENBERG proposed a limited test; he would present the technique which he would send to Prof. PELLERIN after having sent it to Dr. SCHULLER.

Methods 2 and 3. These methods had previously given rise to numerous comments. The procedures would be prepared by Dr. SCHULLER and

Prof. PELLERIN and they were also the subject of a study by the Commission on Food Additives. Dr. SCHULLER and Prof. PELLERIN would jointly establish the methods to put into circulation.

Method 4. Dr. Egan had prepared a note concerning this method. After general discussion and the intervention of Drs. SCHULLER and KOJIMA, Dr. GUTHENBERG agreed to draft the technique. Dr. HAENNI would send Prof. PELLERIN the tests and methods recommended in USA.

Method 5. The procedure would be established by Prof. PELLERIN.

Method 6. The wording of this method was not clear. Prof. TRUHAUT would ask for clarification from Mr. BARTHELEMY.

5. Circulation of Methods

1. The prepared methods would be sent by 1 December 1975 to Prof. PELLERIN.
2. December 1975: dispatch to all Members of the Commission on Food Additives and the Food Section.
3. Dispatch of comments to Prof. PELLERIN before 1 April 1976.
4. The comments would be assembled by Prof. PELLERIN and studied by the Commission on Food Additives on 10 May 1976 in Paris. The Liaison Group would then meet at the beginning of June 1976, in principle, in Paris. A new circulation schedule would be brought out if necessary and the definitive report presented at the Food Section meeting in Paris (13-15 September 1976).
5. The dispatch of methods to CEE would be at the end of October 1976.

6. Miscellaneous Matters

At the request of CEE, the use of atomic absorption had been envisaged for the determination of the elements Pb, Cu, and Cd in food additives. During the general discussion in Brussels this year it was specified that this determination concerned the elements in the additives and not in foods.

Prof. PELLERIN said that the use of atomic absorption had been studied in his laboratory by one of his pupils. Dr. SCHULLER asked a question on the use of atomic absorption in relation to the global determination of heavy metals by chemical analysis. Profs. BELCHER and PELLERIN said that the use of atomic absorption for the detection of traces of metallic impurities in the organic composition figured equally in the study programmes of the Commission on Food Additives. Prof. PELLERIN would prepare a note

which would be sent to the Members of the Coordinating Committee.

Prof. TRUHAUT thanked all Members present for their participation in the meeting. Dr. EGAN, in the name of the Members of the Coordinating Committee and himself, thanked Prof. TRUHAUT for having led the meeting despite his present ill health, wished him a speedy recovery, and also thanked him for his effective action in respect of CEE.

FINANCE COMMITTEE

6 September 1975

Present: Dr. J. W. BARRETT (Chairman), Prof. A. BJORKMAN, Mr. J. BROCARD, Dr. K. HOSHINO, Prof. G. E. ZAIKOV, Prof. O. HORN. The President (in part) and Executive Secretary of the Union were in attendance.

Report on 82nd Meeting of Executive Committee

Dr. BARRETT elaborated briefly on a report of those matters of a financial nature considered by the Executive Committee. In particular, he was concerned with the comment that the level of the Union's financial reserves was likely to receive adverse criticism from UNESCO and ICSU. The Finance Committee emphasized that it was not merely prudent, but vital for IUPAC to maintain its reserves. These provided a source of income to help support the present operations, and they constituted a safeguard should there be a substantial reduction in the Union's other income at any time.

Prof. HORN gave an account of spending to date from the 1974 residual Division Contingency Funds of \$26,000. Dr. BARRETT said that in the revised IUPAC General Purposes Budget for 1975 (as of 75.02.18), it would have been more realistic to have included under Income a transfer from reserves of \$26,000 to meet this Expenditure in full. Also, the Treasurer reported on the data he had so far assembled on different subsistence allowances for various countries: there appeared to be no firm basis yet for the Executive Committee to make a recommendation to the Bureau.

The Finance Committee looked forward with interest to seeing how much saving had been achieved by the use of mandatory travel arrangements for the IUPAC Conference in Madrid, and whether it would be worthwhile to extend such arrangements to all future operations of the Union.

2. Budget for 1975 and Anticipated Performance

Prof. HORN reported that payments in respect of the Madrid Conference had already reached \$181,622 (as of 75.08.15) and he expected the final expenditure to be about \$200,000 (cf. budget of \$175,500). Taking into account some \$2,000 of unbudgeted support for Conference from Spanish chemical industry, the anticipated deficit for 1975 was increased from \$14,000 (as of 75.02.18) to \$36,500. However, if \$26,000 was transferred from reserves (see item 1), the deficit would be reduced to \$10,500.

The Finance Committee supported the view of the Treasurer that a critical

review needed to be made of how IUPAC conducted its biennial Conference. It was decided that at the next meeting an analysis would be made of the costs of the Madrid Conference, with a view to making recommendations on how expenditure might be reduced in future. This would assist the Executive Committee and Bureau in any reconsideration of the structuring of Conference.

3. Budget for 1976

The Preliminary budget for 1976 (as of 75.02.18) had been revised and separated into a General Purposes Budget and a Publications Budget (as of 75.08.4). Further revisions were made by the Finance Committee to take into account the increased income now anticipated from National Adhering Organizations (see item 6) and the views of Sir HAROLD THOMPSON on royalties from publications with the expected change from Butterworths to Pergamon Press. Sir HAROLD THOMPSON stressed the need for IUPAC to increase substantially the money made available for its scientific programmes, and the budgetted general contingency fund of \$5,000 was raised to \$30,000 to cover new and extended activities. Although there was a deficit of \$9,500 on the Publications Budget, there was an excess of income over expenditure of \$19,500 on the General Purposes Budget.

The General Purposes Budget anticipated that the Bureau would approve the recommendation, already supported by the Executive Committee that the privilege for Company Associates to receive *Pure and Applied Chemistry* at half cost should be withdrawn at the end of 1975. The Finance Committee suggested that an announcement of this policy change should be made to Company Associates through the appropriate channels after the Madrid Conference. Dr. WILLIAMS was asked to investigate with Pergamon Press whether the 25% discount on publications purchased by the Union could be extended to PAC for Company Associates.

4. Financial Forecast for 1977-8

In order to obtain a general financial forecast for 1977-8, it was agreed to extrapolate from previous biennia. A large deficit was foreseen for 1977-8. The Finance Committee decided to make a cost analysis investigation of the location and pattern of meetings of IUPAC bodies, from which it hoped to make recommendations for possible better use of the available income without detriment to the activities of the Union.

5. Review of Investments

A Securities Account Statement (as of 75.07.22) provided by the IUPAC Banker was studied and the recommendation to make no changes in the investments was accepted.

6. Subscription Scheme for National Adhering Organizations

(i) *Status Report for 1975*

As of 75.07.31, income from National Adhering Organizations for 1975 totalled \$148,100 (cf. budget forecast for the whole year of \$168,850). There were outstanding national subscriptions of \$21,000, with an additional \$6,900 still unpaid from 1974 and earlier years. The Finance Committee reaffirmed its support for implementation in full of revised Statute 9.2 at the end of the year, which would mean that unless Belgium, Brazil, Chile, Mexico, and Nigeria paid their 1974 subscriptions, they would automatically cease to be Members of the Union.

(ii) *Review and Updating of Category Allocation According to National Chemical Turnover*

The Executive Secretary reported that applications for change in membership category from Arab Republic of Egypt (C to B1) and USSR (A1 to A2) were to be considered by Council at Madrid. These changes would raise the annual income from National Adhering Organizations by \$12,200. Therefore, the Finance Committee decided to increase the 1976 estimate for income from member countries to \$180,000.

Dr. BARRETT presented a paper giving a preliminary list of category changes appropriate to 1972 national chemical turnovers (based on OECD official figures). If the listed 18 countries all moved to the new appropriate category, the potential extra income was estimated to be \$66,900 per annum.

It was *Resolved*:

that the Finance Committee recommends the Executive Committee to take all possible steps during the next biennium to urge, where necessary, each member country to move voluntarily into the category equivalent to its chemical turnover, with a view to requesting Council at the 1977 Conference to make the requirement mandatory.

7. Membership of Committee

The Chairman had received no further nominations to fill the vacancies arising from the retirement in 1975 of Mr. BROCARD and Dr. HOSHINO.

Therefore, the Finance Committee would recommend the Executive Committee to appoint Prof. J. MATHIEU (France) and Dr. W. GRAULICH (Federal Republic of Germany) as new Members.

A letter of resignation from the end of the present meeting had been received from Dr. BEAVERS. The suggestion of the US National Committee for IUPAC that he be succeeded by Dr. B. W. ROSSITER (USA) would be supported by the Finance Committee.

8. Date and Place of Next Meeting

The next meeting was reaffirmed for 16-17 February in Zürich. In concluding the proceedings, Dr. BARRETT expressed a warm vote of thanks to Mr. BROCARD and Dr. HOSHINO for their good service on behalf of IUPAC.

INTERDIVISIONAL COMMITTEE ON MACHINE DOCUMENTATION IN THE CHEMICAL FIELD

2-4 September 1975

Present: Prof. J. -E. DUBOIS (Chairman), Dr. D. C. VEAL (Secretary), Prof. B. BOKIJ, Prof. S. FUJIWARA, Dr. H. SCHENK, Dr. C. SUHR, Dr. F. A. TATE, Dr. J. J. B. VAN EIJK VAN VOORTHUIJSEN. In attendance: Dr. J. W. BARRETT (in part)

1. Minutes of Previous Meeting and Matters Arising

The minutes of the last meeting held in Columbus, Ohio, USA (17-19 October 1974) were approved [see *Inf. Bull.* Nos. 50/51 (November 1975), pages 106-108]. With regard to the Committee's goals and tasks the revised paper circulated by the Secretary represented an adequate description of the Committee's charter, although it was felt to be too broad to constitute a description of goals and tasks in itself. However, in combination with the paper drafted out in Columbus it provided a good basis for the Committee's programme of work. Dr. TATE reported that CAS was continuing work on nomenclature generation, and papers describing this would be circulated to the Committee in due course.

(i) *CAS review of phane nomenclature.* Dr. TATE apologized for the fact that the proposed review of recommendations for phane nomenclature had not been completed. This would be done and the results circulated to members.

(ii) *Polymer Coding Methods.* Dr. SUHR reported that he had begun gathering information on this topic, but he felt it to be too broad for any useful survey to be completed in a short time. It was therefore agreed to restrict the survey initially to methods of coding *structural* information of polymers. Dr. SUHR proposed to analyse the principles employed by four major existing systems, namely those of CAS, ICI, Dupont and IDC. Dr. TATE agreed to supply information on CAS practice and Dr. VEAL to seek information from ICI. In addition, all members should send to Dr. SUHR details of relevant work. In the first instance these should comprise references and brief notes, rather than papers themselves.

(iii) *Error Statistics in Published Data Bases.* Prof. FUJIWARA reported

further results from Japanese work in this area. Dr. TATE commented that CAS were continuing to develop improved automatic vocabulary and quality control procedures.

2. Reports on Developments in Machine Documentation

Reports from two Members on the state of the art in their respective countries were presented.

(i) *Japan*. Prof. FUJIWARA tabled two papers covering current work in Japan. Apart from error rates these dealt with automatic structure assignment from analytical data, the compilation of specialized bibliographic files for individuals and small groups and the consequent need for a chemical thesaurus, and an on-line retrieval system covering chemistry and other disciplines to serve university users in Japan.

(ii) *Soviet Union*. Prof. BOKIJ described an automated information retrieval system for organic reactions being developed by MISHCHENKO, and a recently published Russian-English-German dictionary of reaction terms. Prof. BOKIJ also tabled copies of a current awareness title bulletin, and a section of *Referativnyi Zhurnal*, dealing with preparative organic chemistry. Both of these are computer produced. The second topic concerned classification of minerals and Prof. BOKIJ tabled two papers on this. He reported that a thesaurus of mineralogy, jointly prepared by VINITI and ZIID, would be published next year.

3. Relationships with Other Organizations

(i) *UNISIST Reference Manual for Machine-readable Bibliographic Descriptions* (SC. 74/WS/20). The Secretary reported that he had reviewed this Manual but, since it concerned bibliographic data and was not specific to chemistry, it was not particularly relevant to the Committee's work.

(ii) *ICSU AB Working Group in Chemistry*. Dr. BARRETT (ICSU AB) presented a brief written report covering:

- (a) data flagging and tagging
- (b) relationships with IUPAC
- (c) international classification for chemistry
- (d) cooperation between primary and secondary services
- (e) IUPAC symposium on 'Techniques for the Retrieval of Chemical Information'

He then amplified various points in discussion. On point (a) it was noted that Prof. FUJIWARA was a member of the IUPAC *ad hoc* committee on Data Flagging. Dr. BARRETT reported that work on point (c) was at a very preliminary stage, but it was envisaged that the ICSU AB classification for chemistry would be more detailed than that of the UNISIST Broad System of Ordering (see the item which follows immediately). A draft project was in preparation and would be submitted to the Committee for comment.

(iii) *'Broad System of Ordering (BSO) for UNISIST—Draft Scheme and Questionnaire.'* The Committee expressed reservations about the treatment of chemistry in the BSO, but in the light of subsequent discussion during the joint meeting with Commission I.1 (see item 4), decided to take no action.

(iv) *Relation with ISO.* ISO TC/46 Documentation had invited IUPAC to send a representative to its first coordination meeting in Utrecht, The Netherlands, on 5 June 1975. Dr. VAN EIJK VAN VOORTHUIJSEN attended this meeting, which was intended to better coordinate the activities of the Subcommittees and Working Groups of TC/46. ISO TC/46 had started the publication of a quarterly issue, *NEWS about TC 46*, which was primarily intended to inform frequently and quickly those interested in standardization in the field of information, documentation and library work. It will also contain brief contributions from some of the other Technical Committees of ISO and from other organizations, who were invited to use this publication as a means for dissemination of relevant information.

Dr. VEAL reported that, although revision of ISO/EUSIDIC work on standardization of tape formats (ISO TC/2709) was going ahead, there was nothing specific to report at this time.

3. Machine Interconversion of Chemical Structure Representations

(i) *Typology.* Prof. DUBOIS presented a review of the whole field of chemical structure typology and Prof. FUJIWARA presented some papers on the typology of ring structures. It was agreed that whilst such typological studies were of great importance, the Commission would not discuss them in detail at the present meeting. Rather, all members should seek to pursue these studies by correspondence before the next meeting, either by comment on the present papers or by original contributions. Prof. FUJIWARA agreed to circulate a further paper on the ring structure work.

(ii) *Compatibility of the Chemical Information Systems and Conversion of Structural Languages.* Prof. DUBOIS presented a paper on the subject. Initial

discussion rapidly identified differences in interpretation of the concepts. Consequently it was decided that the first step must be the development of a logical set of definitions for terms which were necessary for meaningful discussion of the topic. Lengthy discussion led to an agreed set of definitions, which were used in the subsequent discussions.

(iii) *Registry III to Registry II Conversion.* Dr. TATE reported that Registry III had more information and better error control routines than Registry II. He explained several consequent problems in trying to convert from III to II, which threw light on some important principles underlying the transcoding process. He also presented figures for resources involved in the successive development of the Registry System, which illustrated what a complex, time-consuming and expensive process transcoding could be.

(iv) *CAS Registry System Files: Handling of Data and Data Elements by the Basel Group.* Dr. SCHENK reported on how the Swiss group made use of the CAS materials, by using CAS structure records to build a chemical structure search system.

(v) *Conversion of CAS Connection Tables into IDC Topological Representations.* Dr. SUHR reported on the use which IDC made of the CAS files. Their processing sequence was very similar to the Swiss group's work. The GREMAS system has recently been extended to provide improved treatment of more general Markush structures and polymers, and a compatible system for inorganic compounds has been developed.

(vi) *U.K. Experience on Machine Interconversion of Chemical Structure Representations.* Dr. VEAL reported on four UK systems—CROSSBOW (ICI), Pfizer System, Sheffield/UKCIS, Crystallographic Data Centre. It was noted that comparison of WLN files with others needed full structure match because such files tended to contain errors, unidentified synonyms, etc. Also the pattern tends to be that names and/or structures have to be generated prior to WLN generation and so must be considered as part of the system.

(vii) *DARC Experience on the Computer Interconversion of Structural Languages.* Prof. DUBOIS described how CAS connection tables are converted, in the DARC system, into connection matrices, compact connection tables, DEL (*Descriptions of Environment to a Limit*) records, and fragments by way of a pivot language. WLN to DARC conversion has also been implemented. Prof. DUBOIS tabled a further paper on DARC.

Besides this transcoding of CAS to DARC, Prof. Dubois gave a summary

of the DARC input and output system where the encoding step started at the formula-drawing stage by means of an interactive tablet and display, and ended after sub-structure search, with a final decoding step that gave the formula of the answer on display. In this handling of structures and substructures, the DARC coding steps were transparent to the user, who dealt only with structural formulae.

Prof. DUBOIS also reviewed work on the typology of structures. Two-dimensional structures had been divided into 19 classes, and three-dimensional, Markush and polymers were under study. Work was also being done on reaction documentation. Prof. DUBOIS agreed to supply copies of some of his recent lectures covering these and related topics.

(viii) *Extraction of Principles and Relation to Framework Document.* Discussion of the varied experience of members led to the preliminary identification of a number of principles and related points, on the basis of certain premises, applying to the transcoding process. It was agreed that these would be reviewed by all members and comments be sent to the Secretary. The Secretary would prepare a revised version for circulation. Once the text had been agreed, members would submit illustrative examples. The ultimate aim was to produce a document for publication, to stimulate discussion of these matters by the chemical community at large.

4. Joint Meeting with Commission I.1

This meeting, which was called by Commission I.1, was chaired by Dr. R. N. JONES. The main topic was proposals by ISO and ANSI for representations for units to be used in systems with limited character sets. It was agreed that Commission I.1 would be the most appropriate contact point within IUPAC, since most comment would be concerned with ensuring that those units used in chemistry were adequately covered and that there was a minimum of conflict with existing practice in chemistry. Since the proposals were specifically geared to limited character sets there were unlikely to be any computer processing problems. Dr. TATE undertook to have the CAS representative on the Codata Task Force keep Commission I.1 informed of developments.

On the UNISIST BSO proposals Dr. JONES commented that strong reservations had been expressed by the UNISIST Advisory Committee itself, and there would be no further action until the subject groups had had an opportunity to comment. IUPAC as a body would probably comment on the treatment of chemistry within the BSO. It was agreed that this obviated the need for detailed reply by way of the questionnaire at this time.

5. Topic for Next Meeting

Dr. TATE commented that so far the Committee had studied principles from the point of view of the technical content of the subject matter. It might now be appropriate to review the problems from the user's viewpoint. After elaboration of this idea in discussion, it was agreed that the next meeting be devoted to a study, from the point of view of the user community, of the current use of systematic and non-systematic nomenclature and its problems, with special attention to the purpose of nomenclature and how the reliability, effectiveness and economics of the communication process can be improved. This study should cover both the written and oral communication of information about chemical compounds among scientists, and should consider the present and future role of nomenclature, particularly systematic nomenclature, in meeting the communication needs of scientists. It was agreed that all members should try to assemble reports of relevant experience before the next meeting, and the following specific responsibilities were assigned:

Prof. DUBOIS—Possible impact of modern systems such as DARC on nomenclature. Feasibility of studying use of nomenclature in primary literature of chemistry.

Prof. BOKIJ, Prof. FUJIWARA, Dr. VAN EIJK VAN VOORTHUIJSEN—Use of nomenclature for national environmental problems.

Dr. SCHENK—Nomenclature of pharmaceuticals and dyestuffs.

Dr. SUHR—Polymer nomenclature.

Dr. TATE—Uses of nomenclature other than those dealt with by other members.

Dr. VEAL—Use of nomenclature in interlinking files.

Dr. TATE also undertook to circulate some relevant papers to all members. He commented that he felt it would be useful, particularly in view of the topic decided for the next meeting, to review the results of the present meeting in discussion with Dr. LOENING, and suggested Dr. LOENING attend a future meeting of the Commission.

6. Data and Place of Next Meeting

Dr. SCHENK undertook to investigate the possibility of holding the next meeting in Switzerland. It was agreed to hold it about late September in 1976.

COMMITTEE ON TEACHING OF CHEMISTRY

4–5 September 1975

Present: Prof. C. N. R. RAO (Chairman), Mr. D. G. CHISMAN (Secretary), Prof. I. V. BEREZIN, Prof. M. LAFFITTE, Prof. G. ILLUMINATI, Prof. D. VITOROVIĆ (Members); Dr. H. SADEK (Arab Republic of Egypt), Prof. A. H. GUERRERO (Argentina), Prof. B. T. NEWBOLD (Canada), Prof. J. GAŽO (Czechoslovakia), Dr. U. HOFACKER (Federal Republic of Germany), Dr. I. DILARIS (Greece), Prof. R. C. MEHROTRA (India – representing Prof. N. V. SUBBA RAO), Prof. I. ELIEZER (Israel – representing Dr. D. SAMUEL), Prof. B. JEŻOWSKA-TRZEBIATOWSKA (Poland), Dr. SANG-UP CHOI (Republic of Korea), Dr. P. LYNCH (South Africa – representing Prof. R. R. ARNDT), Miss E. GOODALL (UK – representing Dr. M. D. Robinson), Prof. W. B. COOK (USA) (National Representatives); Dr. G. DONTSOV (UNESCO), Prof. M. G. FRAZER (FECS), Mr. T. H. G. MICHAEL (Chemical Institute of Canada), Dr. G. SCHEYTT (representing Dr. H. HELLMANN) (Observers); Dr. J. W. BARRETT (Chairman, International Company Associates Group), and Chairman and Members of the Commission on Teaching of Clinical Chemistry Section were specially invited to attend the meeting for specific items on the agenda.

1. Report of Previous Meeting and Matters Arising

The Committee reviewed the various recommendations of the Conference on New Trends in Chemical Education held in Wrocław in September 1973, which had been considered by the Committee during its last meeting. It was agreed that some of these recommendations would be discussed during the present meeting, particularly when considering the future programme, but it was noted that a few of the recommendations had already been implemented – notably the publication of an *International Newsletter on Chemical Education* and the organization of a symposium on Education Technology. The majority of recommendations, however, were still awaiting action.

The Committee received, for information, a report giving the views of the British Committee on Chemical Education on the different recommendations, and also examples of statistics in chemical education, compiled by the Chemical Society in UK, and a catalogue of films and other aids (mostly unpublished) compiled by the Education Techniques Group of the Education Division of the Chemical Society. It was agreed that these examples of activities in the UK corresponded to specific recommendations of the Wrocław Conference and the

view was expressed that similar activities in other countries should be encouraged and reported in due course. The role of National Representatives in arranging for the Wrocław recommendations to be discussed and considered was emphasized, as also was the need for the recommendations and news of follow-up actions to be published in chemical education journals.

2. Atomic Weights Table

The availability of a simplified four significant figures atomic weights table with introductory explanation was noted with pleasure. This had been compiled by IUPAC Commission on Atomic Weights in consultation with the Committee.

It was agreed that this Table should be made more widely available and it was suggested that the Committee in conjunction with the Atomic Weights Commission should investigate with the IUPAC Executive Committee the possibilities of wide distribution. Some suggestions for improving the introductory remarks were made, particularly concerning the explanation of 'relative atomic mass', and it was also suggested that these remarks and the Table itself should be made available in other languages, if possible.

3. International Newsletter on Chemical Education

The publication of this *Newsletter*, with financial support from UNESCO, had been the most significant development in the work of the Committee since its last meeting and the Members of the Committee expressed their appreciation to the Editor, Prof. RAO. It was realized that the first two issues were experimental in the sense of content and distribution and various suggestions were made for improvement. In particular a suggestion that the *Newsletter* might be used as a means of reporting *research* in chemical education was supported. Most research papers in this field were published in education journals not normally seen by chemists. The *Newsletter* would provide a link between chemists interested in education and research workers in chemical education. Prof. FRAZER, University of East Anglia (UK), agreed to compile this new section of the *Newsletter* on an experimental basis for a year or so.

The question of long-term support for the *Newsletter* was raised and it was agreed that this should be discussed at the special advisory meeting with UNESCO in Madrid. For the immediate future it was noted, with pleasure, that a new UNESCO contract would support the publication of the next few issues. It was suggested, however, that an assessment of the distribution and impact of the first few issues should be made by means of a questionnaire from the IUPAC Secretariat to National Representatives.

The Editor confirmed that there was no copyright on the *Newsletter* and that editors of chemical education journals in various countries should feel free to reproduce or to translate articles as desired.

4. Relations with Other IUPAC Bodies

(i) *Commission on Atomic Weights* – see item 2 above

(ii) *Commission on Analytical Radiochemistry and Nuclear Materials (V.7)*

It was reported that IUPAC Commission V.7 would like the collaboration of the Committee in distributing, through National Representatives, an inquiry into the methods, practices and restrictions on the teaching of radio and nuclear chemistry in universities and schools in the various countries. This was agreed on the assumption that the analysis of replies would be the responsibility of Commission V.7. At the same time Commission V.7 would be developing some teaching guides and experiments in teaching radio-chemistry.

(iii) *Commission on Teaching, Clinical Chemistry Section*

Following the joint discussions held in 1973 it was agreed that a joint working party should be established to develop and stimulate interest among chemists in clinical aspects by devising some curriculum materials and methods. (The nominations from the IUPAC Teaching Committee subsequently suggested were Prof. A. H. GUERRERO, Dr. U. HOFACKER and the Chairman.) It was also agreed that a note about the teaching of clinical chemistry should be written by the two Chairmen for publication in the *Chemical Education Newsletter*.

5. Laboratory Workshop in Chemistry

Dr. SANG-UP CHOI gave a brief report on the Laboratory Workshop held at Seoul in August 1975, with the collaboration of the Committee which was responsible for selecting and sponsoring (under contract with UNESCO) the consultant/adviser to the workshop, Dr. D. J. WADDINGTON (University of York, UK). The Committee noted this new development and was pleased to learn of the success of this first project. Further discussion would be held with UNESCO on 9 September.

6. Federation of European Chemical Societies (FECS)

Prof. FRAZER presented a report on the principal activities of the Education Group of FECS during the last two years as follows:

- (a) Pilot study of European chemical education and compilation of a list of chemical education specialists in Europe (under UNESCO contract).
- (b) Survey of European chemical education – sponsored by UK Chemical Society and Royal Society.

- (c) Preparation of a booklet of activities in chemical education organized by the various Chemical Societies in Europe.
- (d) Organization of the Symposium on Chemical Education in Europe (Madrid, 7–8 September) for which 22 papers had been contributed.

It was reaffirmed that collaboration with FECS, as a regional organization, was most important for chemical education and that joint activities, such as symposia, should be arranged in the future, similar to the two Madrid symposia.

7. Symposium on Educational Technology

Prof. RAO reported on the arrangements for the Symposium (Madrid, 6–7 September) and specifically on the plans for publishing the proceedings. [The Symposium attracted nearly 150 participants, most of whom also registered for the European Symposium (7–8 September), and seemed to be appreciated by all who attended.]

8. Continuing Education of Chemists in Industry

Dr. J. W. BARRETT, Chairman of the International Company Associates Group (ICAG), reported on discussions within ICAG of the problems of training of chemists within industry. It was clear to him that there was a big disparity between countries on the legislation, needs and mechanisms for continuing education and training within industry and he invited the Committee to establish a joint Working Party with the following terms of reference:

- (a) To survey the present position and arrangements for continuing education and training of chemists in industry in the Member Countries of IUPAC.
- (b) To collect examples of industrial training methods and programmes in chemistry.
- (c) To study the interchange of university and industrial staff.
- (d) To submit a report with recommendations.

This was agreed and it was suggested that the network of National Representatives of the Committee as well as the 147 Company Associates of IUPAC and other interested chemists should be used to obtain information for the survey and study.

Prof. FRAZER also reported on a UNESCO contract which had recently been negotiated with his Department in the University of East Anglia for

surveying and developing forms of cooperation between industry and universities in chemistry. Although this would have wider terms of reference than the proposed IUPAC Working Party, it was agreed that liaison should be maintained with Prof. FRAZER's project. [Subsequently the following were nominated as representatives of the Committee on the Working Party – to work by correspondence – Dr. COOK (Convener), Dr. HELLMANN/Dr. SCHEYTT, with Prof. FRAZER consulted as necessary.]

9. Chemical Labelling

A report by the Association for Science Education in the UK on the introduction of chemical labels with hazards and safety precautions for use mainly in schools was received. It was agreed that this should be made widely known through the *Newsletter* and through National Representatives.

10. Future Programme

The Chairman reviewed current activities and those already discussed during the meeting (i.e. the *Newsletter*, the Working Parties with the Company Associates Group and the Clinical Chemistry Teaching Commission) and introduced a paper outlining possible topics for a future international meeting concerned with the changing needs and attitudes of students in chemistry, with the poor image of chemistry, with the public attitude to chemistry and with the relation of chemistry and chemistry courses to society.

These suggestions and others submitted by Members of the Committee gave rise to a full discussion. Among the principal conclusions were the following:

- (a) There should be an international meeting in 1977 or 1978 on some aspects of chemistry, chemical education and society and the attitudes of students to chemistry courses.
- (b) There should be more regional activities in chemical education.
- (c) The recommendations of the Wrocław Conference with respect to statistical surveys in various countries, panels of advisers of chemical educators, surveys of chemical education in developing countries, etc., should be followed up through National Representatives and internationally.
- (d) That note should be taken of the Chemistry Olympiad organized at present in East European countries (next meeting in July 1976, in the German Democratic Republic).
- (e) There should be closer collaboration with the other sciences – flexibility

of courses — and perhaps joint meetings.

- (f) An anthology of articles on chemical education should be prepared.

It was agreed that these points should form the basis of discussions with UNESCO (at the meeting on 9 September in Madrid) and that subsequently a programme of activities for the Committee should be prepared taking due note of the recommendations of earlier Committee meetings and conferences.

It was also agreed that although some of these activities would hopefully receive UNESCO support, it was essential for the Committee to have its own budget for ongoing programmes and regular activities (e.g. the *Newsletter*), including secretarial support.

11. Miscellaneous

- (i) Reports of the activities of ICSU Committee on Science Teaching were received.
- (ii) A book issued by the IUPAC Commission on Colloid and Surface Chemistry (I.6) on *Physical Chemistry: Enriching Topics from Colloid and Surface Science*, edited by Prof. H. VAN OLPHEN and Dr. K. MYSELS, was noted with interest and commended.
- (iii) A meeting in the UK on teaching medicinal chemistry to be held in 1978 was noted — its possible relation to the work of the joint Working Party on Clinical Chemistry was mentioned.
- (iv) The possibility of providing more information on IUPAC activities at university undergraduate and school level was raised in correspondence and this need was agreed.

INTERDIVISIONAL COMMITTEE ON NOMENCLATURE AND SYMBOLS

2 and 7 September 1975

Present: Prof. M. L. McGLASHAN (Chairman), Prof. H. M. N. H. IRVING (Secretary), Dr. R. DYBKAER, Prof. W. C. FERNELIUS, Prof. O. HOFFMANN-OSTENHOF, Dr. K. L. LOENING, Prof. N. LOZAC'H, Prof. D. H. WHIFFEN.

In the temporary absence of Prof. IRVING, Dr. DYBKAER was elected to act as Secretary. The following points were discussed by the Committee.

1. Prof. McGLASHAN deplored the fact that IDCNS still had no clear terms of reference and proposed the discussion of three documents he had laid on the table. He pointed out that there was some disagreement whether IDCNS should achieve formal dichotomy in two sub-committees (physicochemical quantities and units, PQU, and the nomenclature of chemical substances, NCS). Prof. HOFFMANN-OSTENHOF urged it was more flexible to appoint *ad hoc* sub-committees that reported back to a single IDCNS.
2. The Chairman stressed his opinion that the membership of IDCNS should have sufficient standing to negotiate with other Unions on an equal footing.
3. The Secretary, who arrived a little late owing to a delayed flight apologized and at a convenient moment circulated his prepared Agenda. This included recommendations of the Executive Committee (82nd Meeting, Moscow, March 1975) concerning the reorganization of IDCNS which had apparently not been seen by the Chairman and Members and which were not entirely consistent with the letter of 4 June 1975 subsequently circulated by the President of IUPAC to all Members. It was agreed that the discrepancies were not such as to prevent agreement on constructive proposals and that these should be made in some detail.
4. Draft proposals by the Chairman (for terms of reference for IDCNS, for its constitution and membership, etc.) were thoroughly discussed item by item and a definitive draft was unanimously approved. The Chairman undertook to submit this informally to the President and Members of the Bureau in the hope that, subject to their approval in general terms, active progress could be made on the proposed new lines during and after the next meeting.

5. The Secretary called attention to several communications from other Divisions where members of IDCNS had been invited to attend joint meetings, and to certain communications from other important bodies (e.g. the American Department of Agriculture) asking for advice on nomenclature problems, and which he felt should be dealt with by the IDCNS.
6. The meeting resumed on 7 September and The Minutes of the previous meeting were approved.
7. The Draft Terms of Reference (item 4 above) were laid on the table in a revised form and were scrutinized item by item. Particular attention was given to paragraphs 6–9 dealing with the proposed composition of the Committee. It was agreed that the task of the Secretary would be heavy and the hope was expressed that he would be able to obtain considerable help from the Secretariat in Oxford.
8. It was agreed that the number of Additional Members appointed by the Bureau should not exceed three.
9. Dr. DYBKAER asked for clarification of various points raised by Members at a meeting of the Section on Clinical Chemistry and was answered by the Chairman.
10. The Committee next examined a series of draft recommendations which had been laid on the table by the Chairman and which it was proposed should be sent to the Bureau and made a number of changes in points of detail.

Prof. IRVING drew attention to the ambiguity arising from the use of the acronyms NCS and PQU to designate sub-committees of IDCNS. As had been pointed out in correspondence during the past year concerning the reorganization of IDCNS, many Commissions of the Union deal with nomenclature problems that cannot be categorized under the heading 'names of chemical substances' and this important interdivisional activity should be fully recognized in the designation of any sub-committee. The possibility of referring to all relevant activities under the heading 'chemical nomenclature and terminology' with the acronym CNT was suggested. Members agreed not to use the unsatisfactory acronym NCS in future documents.

11. The Committee elected the following officers of the newly constituted IDCNS:

Chairman:	Prof. M. L. McGLASHAN,
Vice-Chairman:	Prof. N. LOZAC'H,
Secretary:	Dr. M. A. PAUL.

12. The Committee proposed that the Chairman should write as soon as possible to the Presidents of Divisions and other IUPAC bodies inviting them to nominate representatives who would on appointment become Titular Members of IDCNS for a period of 4 years in the first instance.
13. It was agreed that, subject to the approval of the President of IUPAC, the Chairman should be the representative of IDCNS on CCU, IUPAP SUN, and ISO/TC 12, that Prof. HOFFMANN-OSTENHOF should be the representative on IUB and Dr. DYBKAER on IUPAB.
14. The dates for the next meeting were agreed for 14, 15 and 16 May 1976. The possible venue at Villa Serbelloni (Bellagio), Ravello (Naples) or CIBA (London) would be subject to enquiries to be made by the Chairman and Secretariat.

SECTION ON CLINICAL CHEMISTRY (CCS)

7 September 1975

Present: Dr. D. B. TONKS (Chairman), Prof. P. LOUS (Vice-Chairman), Dr. M. ROTH (Secretary), Dr. R. DYBKAER, Prof. W. SUNDERMAN, Prof. D. H. CURNOW, Dr. R. GRÄSBECK (Titular Members); Prof. A. DEFALQUE, Prof. J. FREI, Prof. M. RUBIN (Associate Members); Dr B. H. ARMBRECHT, Prof. M. HJELM, Dr. C. J. PORTER, Mr. J. C. RIGG (Commission Members); Prof. H. BREUER, Prof. Y. MARDENS (replacing Prof. A. De LEENHEER), Dr. F. MITCHELL, Dr. J. C. NIXON, Dr. E. J. VAN KAMPEN (National Representatives); Dr. P. H. W. VAN DER PLOEG (Observer).

1. Minutes of Previous Meeting and Matters Arising

The minutes of the Meeting held in Munich on 21 April 1974 [see *Inf. Bull.* No. 48 (October 1974), pp. 38–41] were approved after minor amendments.

Before proceeding further with the Agenda, Dr. TONKS proposed and the Section approved, that all Titular and Associate Members, both from Section and Commissions, shall have voting rights.

The proposal to change the Section into a Division had been presented to Bureau, who decided not to reach any conclusion at this time, because of the impending proposal of the formation of a new Division of Health and Environmental Chemistry.

2. ISO Round Table Conference on Reference Materials

IUPAC had been invited to send a delegate to the ISO International Round Table Conference on Reference Materials, to be held in Geneva on 21-23 January 1976. It was felt that the subject was broad but included materials to be used in clinical chemistry. Dr. R. ZENDER, La Chaux-de-Fonds (Switzerland), was proposed as delegate, and Dr. ROTH, as substitute.

3. Chairman's Report to Council

Subsequent to the preparation of this report, a number of formal and informal meetings had been held on the occasion of the International Congress of Clinical Chemistry in Toronto, 6-18 July 1975. A report on these activities was to be made to the IUPAC President by Dr. TONKS. Members interested in the report can ask the Secretary for a copy of it. Dr. TONKS was the IUPAC representative at the Toronto Congress.

4. Report of Commission on Automation

The Commission met during the 3 days 4-6 September 1975. The meeting was devoted to a detailed consideration of the document concerned with ideal attributes of instruments for automatic analysis in clinical chemistry. The document had been sent to Commission V.3 (Analytical Nomenclature) and their comments were discussed prior to a joint meeting of the two Commissions. After discussion, Commission V.3 accepted the document with some changes. Thus, definitions of the following terms were now agreed upon by both Commissions: Automate, Drift, Instrument, Machine, Mechanism, Monitor, Report, Result, Specimen, Sample. The title of the document had now been changed to 'The Characteristics and Attributes of Instruments intended for Automated Analysis in Clinical Chemistry'.

After the Madrid Meeting, the document will be circulated to the Section for approval and then submitted for publication as a Provisional Nomenclature Appendix. Discussions have begun with the Expert Panel on Instrumentation of the International Federation of Clinical Chemistry concerning their proposed areas of activity and future cooperation with the Commission. The Commission had elected Dr. D. YOUNG as its new chairman, Dr. J. BIERENS DE HAAN as new Titular member, and Prof. T. P. WHITEHEAD as an Associate Member. These elections were approved by the Section.

5. Report of Commission on Toxicology

The Commission had held meetings in Munich and London (1974) and Toronto and Madrid (1975). The general programme until 1977 was to place particular emphasis on toxic metals. It was planned to prepare recommendations for the analysis of such metals. The Commission was also planning an International Symposium on Clinical Chemistry and Chemical Toxicology of Metals which will be held in Monte Carlo, Monaco, on 3-5 March 1977, under IUPAC sponsorship. The Symposium Committee will include Prof. SUNDERMAN (Chairman), Prof. BOURDON (Vice-Chairman), Dr. S. BROWN (Secretary and Editor of the proceedings) and Dr. TONKS (Treasurer).

The following nominations were made by Commission and approved by Section: Prof. MERCIER as a new Titular Member; Drs. SAVORY, SPIEGEL, NOIRFALISE and TONKS, re-elected as Associate Members. The Commission had intended to suggest two additional Titular Members for both 1977 and 1979, to reach what was considered to be its required complement of eight.

6. Report of Commission on Teaching

The Commission had met twice in 1974 and twice in 1975. It had completed its monograph on the education and training of the clinical chemist, which includes a survey of the regulations and programmes in different countries and recommendations for the training of chiefs of clinical chemical laboratories. A shortened version, which had already appeared in the IFCC pages of *Clinica Chimica Acta*, is to be published by IUPAC. In Madrid, the Commission had two useful joint meetings with the Commission on Teaching of Chemistry. A proposal was made that science departments of universities develop training programmes for technicians and graduates intending to work in the field of clinical chemistry.

The preparation of education programmes in quality control was envisaged as a further activity of the Commission. The following Titular Members were re-elected: Prof. CURNOW (as new Chairman), Prof. LOUS, Dr. ROTH; Drs. J. PORTER and M. A. SCHWARZ were proposed as new Titular Members. The list of Associate Members was modified and approved as follows: Profs. RUBIN, LATNER, DEFALQUE, and as new Members, Prof. M. M. ABDEL KADER (Cairo) and Prof. P. LOUISOT (Lyon).

7. Report of Commission on Quantities and Units

(Dr. R. DYBKAER, Chairman)

The Commission had met twice in 1974 and twice in 1975. Two documents had been published in final form: Quantities and Units in Clinical Chemistry, Recommendation 1973, and List of Quantities in Clinical Chemistry, Recommendation 1973 (*Pure Appl. Chem.*, 37, 517–572, 1974); a German translation had also appeared, and an Italian and a Spanish translation in preparation.

A draft entitled 'Optical Spectroscopy. Part 1. General Kinds of Quantities. Provisional Rules and Recommendations 1975' had been circulated to different IUPAC Commissions and members, and a number of useful comments were received. The document was also discussed in joint meetings with the Interdivisional Committee on Nomenclature and Symbols and Commissions I.1, I.4 and I.5. The question was raised whether such a document should not be produced for a larger circle of users, but the authors stated that the aim was to meet the particular needs of clinical chemistry. In order to look more in detail at some quantities in spectroscopy, it was proposed to set up an *ad hoc* working party composed of representatives of the Interdivisional Committee on Nomenclature, Division I, Commission 5.4 and the Commission

on Quantities and Units in Clinical Chemistry.

The question of enzyme units was the subject of lively discussions in a joint meeting with Commission I.1 and Prof. McGLASHAN. These interlocutors were not in favour of granting a base status to the enzyme unit 'katal'. A draft on rates and fluxes was also discussed.

Dr. DYBKAER's report was accepted and the Committee assured the Commission of its confidence in any future negotiations.

The new membership of the Commission was agreed upon as follows: Dr. R. ZENDER (Chairman), Mr. J. C. RIGG (Secretary), Prof. HERMANN, Dr. DYBKAER, Dr. SIGAARD-ANDERSEN (Titular Members), Dr. ARMBRECHT, Dr. JORGENSEN, Prof. MÉTAIS (Associate Members).

8. Interdivisional Committee on Nomenclature and Symbols

This Committee has been suggested as the body responsible for submitting to Bureau for publication any document on quantities, units and nomenclature. The idea of a better coordination is welcomed and had, indeed, previously, been expressed by the Section. The Section had some concern, however, on the way such a small group would be able to critically review the volume of documents issued by various commissions. It was also hoped that recourses will be possible against decisions of the Interdivisional Committee.

9. Finance

The financial support required for the Section in 1976 was estimated at \$9150. However, an additional \$600 for a meeting of the Commission on Education in London, as well as support for the *ad hoc* group which was to discuss spectroscopy problems appear very desirable.

10. Status of the Section within IUPAC

A decision on the Section's proposal to become a Division had been delayed by the Bureau in order to first handle the suggestion of a new Division on Health and Environment. The Section felt it was not very appropriate to be included in such a new division, because Clinical Chemistry had now become an important speciality in itself, which in the US alone required prepared reagents to the value of \$500 millions per year, and because the problems and methods in environmental chemistry were too different from those of clinical chemistry. A document suggesting the formation of an *ad hoc*

Committee to study the proposals concerning a possible Division of Health and Environmental Chemistry was prepared and voted unanimously for submission to the Bureau. If such a Committee was set up, it was the desire of the Section to be represented in it.

11. Membership

The new membership of the Section was elected as follows: President: Prof. PER LOUS (Copenhagen); Vice-President and President-Elect: Dr. M. ROTH (Geneva); Secretary: Dr. R. GRÄSBECK (Helsinki); Past-President: Dr. D. B. TONKS (Montreal); other Titular Members: Prof. SUNDERMAN (Farmington), Prof. CURNOW (Perth), Dr. ZENDER (La Chaux-de-Fonds), Dr. D. YOUNG (Bethesda); Associate members: Prof. J. FREI (Lausanne), Dr. F. MITCHELL (Harrow), Mr. P. M. G. BROUGHTON (Leeds), Prof. D. STAMM (Munich), Dr. J. C. NIXON (Rexdale), Prof. J. HOMOLKA (Prague), Prof. V. -V. MENSNIKOV (Moscow), Dr. E. J. VAN KAMPEN (Groningen). Dr. DYBKAER and Prof. T. P. WHITEHEAD, who were not subject to re-election, continue as Titular Members for the next 2 years.

12. IUPHAR

In view of a possible participation of the Commission on Toxicology in the symposium organized by IUPHAR, Dr. SPIEGEL will ask Dr. BURNS for details on the programme. It is further suggested that IUPAC asks UPHAR to designate a representative for contacts with our Section.

13. Cooperation with IFCC

This has functioned very well during the past two years, and the wish is expressed to continue on the same lines.

14. Cooperation with WHO

As mentioned in the Chairman's report, active participation of members of the Section to WHO study groups and other meetings had occurred in the past year. More recently, the Commission on Toxicology has accepted to review environmental criteria documents on metals and other toxic agents drafted by WHO. Comments had already been sent by Prof. BOURDON on a document on lead, and by Prof. SUNDERMAN on magnesium. Prof. SUNDERMAN had been invited to participate in a symposium on carcinogen detection to be held in Lyon (France).

The Section of Health Laboratory Technology of WHO intended to establish and distribute an international reference serum for determinations such as calcium, phosphate, sodium, potassium, chloride, urea, creatinine, uric acid, bilirubin and cholesterol. It had asked several organizations, among which the Section, for comments on this project. It seems that such a reference material could be very useful; however, careful work is needed to determine the stability of the preparation, the proper assignment of values and the appropriate methods applicable to the use of this reference material.

COMMISSION ON AUTOMATION (CACC)

4-6 September 1975

Present: Prof. T. P. WHITEHEAD (Chairman), Prof. M. HJELM, Dr. D. S. YOUNG (Titular Members); Dr. J. BIERENS DE HAAN (Associate Member).

1. The minutes of the previous meeting (Munich, 19-20 April 1974) had been published in *Inf. Bull.* No. 48 (October 1974), pages 35-36.

2. Members of the Commission reviewed their draft document 'The Characteristics and Attributes of Instruments Intended for Automated Analysis in Clinical Chemistry'. The criticisms of outside reviewers were examined and in the light of these many sections of the document were extensively revised. In this connexion the Commission had a joint meeting with Commission V.3 to examine the criticisms of the document by that Commission. The intent of the document was explained and the comments of Members were carefully assessed and matters of disagreement were resolved.

3. The Commission met with Dr. F. L. MITCHELL, Chairman of the Panel on Instrumentation of the International Federation of Clinical Chemistry, and reviewed the areas of interest and overlap of the two committees. The Commission agreed to limit its activities to automated or mechanized instruments and to concentrate its next efforts on the evaluation of performance of automated instruments.

4. The document 'Characteristics and Attributes of Instruments Intended for Automated Analysis in Clinical Chemistry' had been prepared for circulation to Clinical Chemistry Section and outside experts prior to publication by the appropriate IUPAC channels.

5. Dr. D. S. YOUNG was appointed chairman of the Commission on Automation.

COMMISSION ON QUANTITIES AND UNITS (CQUCC)

3–6 September 1975

Present: Dr. R. DYBKAER (Chairman), Dr. B. H. ARMBRECHT, Prof. R. HERRMANN, Prof. P. MÉTAIS, Mr. J. C. RIGG (Titular Members CQUCC/EP on QU); Dr. R. ZENDER (Titular Member EP on QU); Dr. K. JØRGENSEN (Observer).

1. These sessions were to be considered as a joint meeting of CQUCC and of The Expert Panel on Quantities and Units (EP on QU) of IFCC.

2. Minutes of the meetings held in Wageningen on 18–21 March 1975 and 29–30 April 1975 were reviewed and approved.

3. *Membership.* Dr. DYBKAER offered his resignation as Chairman and was elected to remain as Titular Member beyond the statutory 8 years. As former chairman, he was asked to represent the group on other IUPAC bodies: IDCNS, CBN and Section on Clinical Chemistry. Mr. RIGG was elected Secretary of CQUCC/EP on QU. Dr. ZENDER was elected chairman. Dr. ARMBRECHT and Prof. MÉTAIS had reached the end of their 8 years membership and were elected Associate Members. Dr. JØRGENSEN, a former Titular Member was also elected an Associate Member. Prof. HERRMANN was re-elected Titular Member for a further 4 years. A clinical chemist with physico-chemical background was elected subject to his agreement, which could not be elicited during the meeting. Commissions of Physical Chemistry Division were approached to suggest a new sixth member to develop recommendations already drafted on pH and 'activity' in the document 'Thermodynamic Properties of Solution and Plasmas'.

4. Dr. DYBKAER reported verbally on the meeting he, Dr. ARMBRECHT and Prof. MÉTAIS had held with Associate Members of EP on QU and on contacts with other groups at Toronto on 12 July 1975. The minutes of the meeting had not yet been finalized.

5. *Members' Reports on Implementation of 1973 Recommendations.* Dr. M. GURRIA RAFOLS of Mexico had translated the 1973 recommendations on 'Quantities and Units' and List of Quantities in Clinical Chemistry' into Spanish, but the text had not yet been published.

Dr. ARMBRECHT circulated new US-NBS guidelines on SI. He had written two articles on the statistical evaluation of methods (see references to DOLS & ARMBRECHT under item 8).

Prof. MÉTAIS reported that *Annales de Biologie Clinique* had published comprehensive instructions to authors, based on the 1973 recommendations. The French text of the 1973 recommendations, as published in Switzerland, had been accepted by the French Académie des Sciences but had been voted down by the Académie des Sciences Médicales.

Clinical biology had been legally recognized as a professional training for graduates in either medicine or pharmacy.

Dr. ZENDER reported that the Swiss recommendations had been published [for ref. see item 8 (i), (ii)]. Consultations were under way for implementation. Simpler papers were being drafted to publicize the operation. Resistance to change had been encouraged by the example of the United States.

Mr. RIGG was drafting some guidelines on the presentation of data from trials with pesticides and other 'biologically active substances'. He reported a move among British cardiologists to prevent the switch from mmHg to kPa for recording blood pressure because of the alleged danger to human life. He had provided Federation Internationale de Documentation (FID) with comments on the draft BSO (broad system or ordering) subject code. The part on medicine required reconstruction.

Prof. HERRMANN reported that implementation in West Germany was irregular: some laboratories had introduced SI; others had not. The paper by STAMM was widely disseminated. *Z. Klin. Chemie klin. Biochem.* now requested authors to use SI.

Dr. DYBKAER had continued to act as spokesman for the group on quantities and units in enzymology.

6. *Views of IFCC and Physical Chemistry Division on 1973 Recommendations IFCC Council's View.* At the Council meeting before the IFCC Congress in Toronto in July 1975, the two recommendations had been debated before voting on their acceptance as IFCC recommendations. The Australian representative had asked for the recommendations on enzymology to be deleted but the chairman, Dr. RUBIN, had ruled that the recommendations be accepted or rejected as a whole. In the event, neither happened and the documents were referred back by 15 votes to 14 on a second count. (Committee on Standards later ruled that no recommendations on enzymology could be promulgated until the issue was resolved.) Further discussions during the IFCC Congress suggested that objections were more of nomenclature than conceptual. Dr. D. W. MOSS of the IFCC Expert Panel on Enzymes (IFCC-EPE) might accept a new term, for instance 'catalytic ability

as suggested by Dr. H. B. F. DIXON, Observer to the IUB Commission of Editors of Biochemical Journals. Dr. DYBKAER had proposed contraction to a single word, such as 'catability'. There seemed to be some understanding that 'enzymic activity' did not adequately distinguish the rate of reaction in the assay system from the 'catalytic amount' in the biological system. Most of the parties concerned had agreed to meet again at Pont-à-Mousson on 6 October 1975, but in view of the need to reconcile also the views of Commissions I.1 and I.6, a later meeting might be desirable, perhaps at Munich in April 1976.

Views of Commission I.1. The impasse centred around:

- the names of the quantities. CQUCC/EP on QU expressed its willingness to accept 'catalytic ability' or 'catability', the latter being more compact but inferior etymologically.
- the dimension of the quantity. The number of base quantities in any system is partly a practical decision. Provisional base status for 'catalytic amount' was more convenient but was rejected by Commission I.1 during the joint meeting. Dr. DYBKAER was asked to draft a letter to Commission I.1, seeking their approval for supplementary status.
- the coherent SI unit. If katal were accepted as a derived unit (as proposed by CBN), it could not be restricted to catalytic amount but could also be used for rate of reaction and for substance flux, being only a special name for $\text{mol}\cdot\text{s}^{-1}$. Provisional base status, as recommended by CQUCC/EP on QU in 1973, avoided the difficulty of understanding that, for instance, catalytic concentration was the rate of reaction of component B in one system (the assay system) in relation to the volume of another system containing the catalyst (or enzyme) but not necessarily component B. Supplementary status (along with radian and steradian) could circumvent this difficulty.
- the definition of the quantity or unity, according to acceptance of derived status or supplementary. There seemed to be a consensus of agreement, except with Commission I.6, who had defined 'catalytic activity' for heterogeneous catalysis without resort to an assay system. It might be possible to construct a more theoretical definition of the enzymological catalytic amount without resort to assay system.

In the light of joint discussions with Commission I.1, Dr. DYBKAER was asked to prepare a paper for such a joint meeting either at Pont-à-Mousson or at Munich. To clarify acceptable ways of circumventing the impasse, he was asked also to request copies of correspondence between

Prof. McGLASHAN and Mr. TERRIEN, director of BIPM.

CQUCC/EP on QU reaffirmed the 1973 recommendation as the preferred standing international recommendation for enzymological data until such time that a proposal acceptable to the various groups can be agreed.

7. *The unit 'unity', proposed symbol I.* In ISO/TC12, the vote had been inconclusive. Other proposals had been I for 'item' and p for 'part' or Latin 'pars'. Since I is already proposed as a designation of the mean of one, the group deemed it ambiguous. CQUCC/EP on QU would prefer amendment of metric rules to allow multiple prefixes before the arabic numeral 1, for instance $10 \text{ kl}\cdot\text{m}^{-1}$ rather than 10 mm^{-1} and G1 rather than 10^9 . Prerequisite to such a change would be phasing out of the symbol l for litre or any improvement of character sets to distinguish 1 and l ('one' and 'el').

8. *Recent Publications and Proposals on Quantities and Units Relevant to Clinical Chemistry*

- (i) CH-ASSM (Academie Suisse des Sciences Medicales = Schweizerische Akademie der Medizinischen Wissenschaften), Commission des Laboratoires = Laboratoriumskommission; 1975-05-28. 'Nomenklatur in der klinischen Chemie und in der Hämatologie: Empfehlungen'. *Schweizerische Arztezeitung* 1975(21)785-790. 10 refs.
- (ii) CH-ASSM: 1975-06-04. 'Nomenclature en chimie et en hematologie: recommandations'. *Schweizerische Arztezeitung* 1975(22)827-832. 10 refs. Text adapted from work by CQUCC/EP on QU; approved translation.
- (iii) CH/OS/DE Societies of Clinical chemistry: 1975. 'Grandezze di misura ed unita' in chimica clinica: raccomandazioni internazionali (IFCC, ISO, IUPAC). *Lab* 2(1)63-73.
Informal translation of the Swiss, Austrian and West German text by the Italian Committee for Standardization of Haematological and Laboratory Methods.
- (iv) COPELAND, B. E.: 1975-07-03. 'The Medical Communication Pathway'. *New England Journal of Medicine* 293: 41-42. 6 refs. (of which 4 by COPELAND). COPELAND's preference for mass over amount of substance in reporting analytical data for medical diagnosis.
- (v) DOLS, T. J. & ARMBRECHT, B. H.: 1975-10. 'Simplex Optimization as a Step in Method Development'. Paper to be presented at the 89th meeting of US-AOAC, Washington, DC, 1975-10. 14 pp.

- (vi) DOLS, T. J. & ARMBRECHT, B. H.: 1975-10. 'Assessment of Analytical Method Performance Characteristics: Systematic Error'. Paper to be presented to the 89th meeting of US-AOAC. 14 pp.
- (vii) FR, Annales di Biologie Clinique: 1975. 'Recommandations Importantes aux Auteurs'. *Annales de Biologie Clinique* 33:iv-viii. Relevant recommendations in either English or French versions, in particular IUPAC, IUB and IFCC, are listed and, as far as possible, the essence is reproduced.
- (viii) INGELFINGER, F. J.: 1975-04-10. 'Metrication on the Crawl'. *New England Journal of Medicine*, 293: 805-806. 6 refs.
- (ix) ISO-DIS-3534: 1975. Statistics. Vocabulary. = Statistique. Vocabulaire. 44 pp.
- (x) ISO-DIS-3725. Statistics. Symbols. = Statistique. Symboles. 4 pp.
- (xi) MORIN, L. G.: 1975. Expressing Enzyme Results. With reply by VANDERLINDE, R. E. (AACC Committee on Standards). *Clinical Chemistry* 21(2)271; 271-272. 4 refs; 18 refs; Cri-de-coeur for a better way of expressing enzyme values for easy interpretation by the clinician. VANDERLINDE deprecates the practice of expressing data relative to 'normal' values, because of effects of sex, age, size and pregnancy. He states that the size of the unit (kat or U) does not influence the quality of the data and that 'complete definition of the units [i.e. of any such data] requires specification of the reaction conditions, . . . methods and temperature'.
- (xii) TONKS, D. B. (Montreal General Hospital): 1975-02. 'Bibliography on SI Units in Clinical Chemistry and Other Related References'. 5 pp. Available from the author. Prepared by the Chairman of Section on Clinical Chemistry for the Canadian switch to SI in clinical chemistry, officially set for 1975 or 1976.
- (xiii) US-FDA (Food and Drug Administration: 1975-06-20. 'Human Drugs: Proposed Rulemaking'. *Federal Register* 40(120)26142-26171.
- (xiv) US-MMS (Massachusetts's Medical Society) Study Committee to Evaluate Changes in Units of Clinical Chemistry Tests: 1975-07-03. [Recommendations. discussion.] *New England Journal of Medicine* 293: 43-44. 3 refs. The report fails to note the 1973 CQUCC/IFCC recommendations. The committee recommends use of 'mass-wgt/vol' rather than 'mols/vol' and for certain electrolytes 'milliequivalent units'. Dr. ZENDER was asked to draft a response by CQUCC/EP on QU.

- (xv) US-NBS (National Bureau of Standards): 1975-06-19. 'Metric System of Weights and Measures: Guidelines for Use'. *Federal Register* 40(119)25837. Legalizes SI including the multiple prefixes peta, P (10^{15}) and exa, E (10^{18}) and reserved derived coherent SI units (permitted only for ionizing radiation) the becquerel, Bq (s^{-1}) and the gray, Gy ($J \cdot kg^{-1}$), all recently agreed by BIPM.
- (xvi) US-NBS Metric Information Office; 1975-07. 'Current Metric Activity'. (Revised). 6 pp. Description of national progress in metrication.
- (xvii) WATTS, G.: 1975-07-17. mmHg to kp: a move to oppose. (Editorial). Response by R. B. ROE. *New Scientist* 67(958), 130; 67(961), 346. WATTS claims that (1) change would cause confusion, expense and danger; (2) cardiologists always measure pressure with columns of mercury; (3) EEC bureaucracy is demanding uniformity; (4) the change is unnecessary. ROE responds that columns of mercury vary with local gravity; he prefers millibars.
- (xviii) YOUNG, D. S.: 1975-04-10. 'Normal laboratory values' case records of the Massachusetts General Hospital in SI units. *New England Journal of Medicine*, 292:795–802. 7 refs.

9. *Open meeting on data flagging (on 3 September 1975)*. In view of the group's objections to data flagging as proposed by Prof. HUME, Mr. RIGG presented an alternative approach to data retrieval, using structured descriptor strings attached to abstracts. The structure could be translated into 'arrow logic' for computer input. Since there was no time to agree on details, CQUCC/EP on QU asked Mr. RIGG to present the paper as a personal contribution. At the open meeting, Prof. HUME's proposal for limited testing of his scheme was passed (11 for; 5 against; 4 abstentions).

10. *Optical Spectroscopy. Part 1 – General Kinds of Quantity*. After discussion of the intended scope of the parts, the title of the document was amended to 'Optical Spectrometry. Part 1—Theoretical Outline' because of the confusion between the 'transmittance' that had been defined and 'internal transmittance' to be defined in Part 2. It might be necessary to transfer derivatives of absorbance to Part 2. Some editorial changes were agreed.

11. *Joint Meeting on Spectroscopy (4 September 1975)*. The draft was referred to a task group of Mr. RIGG, Prof. HERRMANN and Dr. L. GALAN (Analytische Chemische Laboratorium, Technische Hogeschool, Delft; nominated by Commission V.4) and a representative of Division I, to meet for a single meeting of one day, if possible before the Munich meeting (April 1976).

One of the criticisms by other commissions had been the mandatory approach on units. Such a frame, including preferred steps for multiples of 10^{3n} , had been deemed useful for particular disciplines, for instance clinical chemistry. Tables of units could therefore be reheaded as 'preferred' (instead of 'recommended'), 'tolerated' and 'other' (rather than 'deprecated'). Multiples would be rearranged in all CQUCC/EP on QU proposals in sequence from largest to smallest unit symbols.

Another criticism had been of the need to mark innovative names as still awaiting general agreement and to address separate proposals on the systematic nomenclature of quantities to other commissions. Criticism of the definitions represented a difference in approach: some spectroscopists had expressed a preference for operational definitions, which might be difficult to put across to clinical chemists. In the view of CQUCC/EP on QU, the need was for identification of the concepts, though in less concise language than for instance, in ISO-31.

12. *Changes in Properties with Time.* Time did not allow detailed editing of this document; further comments would therefore be collected by Dr. DYBKAER. Aspects discussed included the concept clearance. After consultation with Commission I.1, the term flux was accepted as the general term in names for quantities rather than rate.

Besides the differential fluxes, as commonly defined (e.g. ISO-31), there was a need in biology, including medicine, to define mean fluxes (difference quotients) that ignore brief fluctuations. Distinction seemed desirable between changes in properties (for instance mass) of a component divided by volume or mass of the system, suggested terms 'mass concentration flux' and 'mass fraction flux', and changes in properties of the system divided by volume or mass of the system, suggested terms, for instance, 'volumic mass flux' and 'specific (or massic) volume flux'. Commission I.6 was introducing the term 'voluminal' into their recommendation on heterogeneous catalysis without this distinction. Commissions I.6, CQUCC/EP on QU and AFNOR (correspondent: M. COLL) were agreed on the need for a systematic name instead of 'density' for divided by area; suggested names were 'aréic' (CQUCC/EP on QU), 'áreal' (Commission I.6) and 'surfacique' (AFNOR). Since the area of reference was not necessarily a surface, a term derived from 'area' was preferred.

Mr. RIGG would draft a proposal explaining the need for these and various other systematic terms, and proposing more restricted definitions, for instance for 'specific', than in the IUPAC *Manual of Symbols and Termi-*

nology for *Physicochemical Quantities and Units*. Other concepts needing discussion were: divided by number ('particular', 'numeric' or 'entitic'); divided by distance ('linéic' or 'linéar' and 'gradient'); divided by amount of substance ('molar'); and divided by the quotient of amount of substance and stoichiastic coefficient. The concept 'particular' was needed in virology for expression of particle mass: the terms 'atomic' and 'molecular' were unsuitable, and there had been a tendency to introduce the unapproved unit name 'dalton'.

13. *Optical Spectrometry. Part 2 – Molecular Spectroscopy of Liquid and Solid Systems*. Prof. MÉTAIS presented an introduction and a section on internal transmittance. A new definition was agreed, in the light of a recommendation by AFNOR (NF-T-01-030)

$$\tau_i := (\phi_{tr,1} - \phi_{tr,0}) / \phi_{tr,0}$$

where System 1 contains components A, B, C . . . N and System 0 contains A, C . . . N.

14. *Optical Spectrometry. Part 3 – Molecular and Atomic Spectroscopy in Physico-chemical Plasma*. Prof. HERRMANN pointed out problems in the determination of the effective distance travelled by the beam through the absorptive, emissive or fluorescent system. The terms 'absorption pathlength' (recommended by Commission V.4) and 'sample pathlength' were not always appropriate.

15. *Specifications of Spectrometers*. The question was raised whether the text could be extended to quantities and units defining the performance of instruments and methods, and special characteristics of spectrometers transferred to the other documents 'Molecular Spectroscopy in Cuvettes and on Plates' and 'Molecular and Atomic Emission and Absorption Spectrometry in Physicochemical Plasmas'. Dr. ARMBRECHT was presenting two papers attempting to clarify the concepts of precision and systematic error at the 89th meeting of the Association of Official Analytical Chemists.

16. *IFCC Expert Panel on Quality Control*. Misgivings were expressed in the document 'Quality Control in Clinical Chemistry. Part 1 – General Principles and Terminology', about the statistical terms, which deviated from ISO-DIS-3534 [Item 8(viii)]. The papers by DOLS & ARMBRECHT (*loc. cit.*) explored a different approach to this need.

17. 'Equivalent' and 'Normal' (Appendix No. 36 to IUPAC *Inf. Bull.*). Dr. M. ROTH (Section on Clinical Chemistry) had written to Prof. IRVING objecting to the proposal. A way of solving the need felt by the Commission V.3

within the framework of SI had been presented in a paper by Prof. McGLASHAN. The biological conceptions of 'equivalence', for instance in pharmacology and vitaminology, required closer study.

18. *Thermodynamic Properties of Solutions and Plasmas including 'activity' and pH.* Mr. RIGG presented a second draft, which could be submitted to advice from outside the group. The proposal required a separate document defining quantities associated with energy. This document could not be completed in the near future without new expertise for which approaches had been made within the Physical Chemistry Division. The need for information on this topic was urgent in clinical physiology.

It might be useful to add the relation of solubility with equilibrium constants, and the relation of pH with redox potential and with saturation of haemoglobin with dioxygen.

19. *Viscosity, Surface Tension, etc.* Dr. DYBKAER presented the existing drafts on 'Hydraulics: Mechanical Properties of Fluids'. Prof. HERRMANN queried whether shear stress could be expressed in pascals in view of vectorial differences from pressure. Fuller treatment of pressure than in 'Quantities and Units in Clinical Chemistry. Recommendations 1973' might be useful for cardiologists and respiratory physiologists.

20. *Section on Clinical Chemistry and IUPAC.* Proposals for closer liaison with commissions of other divisions were viewed with favour. Part of the difficulty was felt to be the unequal interplay between pure and applied groups within IUPAC.

The proposed strengthening of IDCNS was welcomed. It was pointed out that the revised *Manual of Symbols and Terminology for Physicochemical Quantities and Units* had been published without circulation within IUPAC of revisions apart from those on radiation (Appendix No. 28 to *Inf. Bull.*).

21. *WHO Consultation on Standardization in Clinical Chemistry, Geneva, 25–26 February 1975.* This meeting had adopted the manner of reporting data recommended in 'Quantities and Units in Clinical Chemistry'. The general approach was agreed to be a considerable step forward. WHO had offered funds to IUPAC/IFCC for the study of test 'kits'.

22. *US-FDA Draft Rules for Drug Testing and Specification.* On behalf of CQUCC/EP on QU, Dr. ARMBRECHT had communicated with US-FDA about new draft regulations for drug tests and specifications, which failed to use internationally defined quantities and units. Subsequent US-NBS regulations could be taken as countermanding the draft regulations and a

letter to US-FDA, to be signed by the Secretary of CQUCC, was drafted, closing the matter.

23. *Future Meetings.* Dr. ZENDER would ask the Secretary of the IFCC Committee on Standards where expert panels would next meet. Suggestions were:

- Munich, before the Analytika Fair, 9-13 April 1976,
- either Strasbourg in October 1976 or Prague before or after the European Congress of Clinical Chemistry, 3-8 October.

The proposed task group on spectroscopy could meet in Wageningen or Giessen, probably for 2 days. Its schedule depended on how far the document could progress by correspondence.

COMMISSION ON TEACHING (CTeCC)

3–5 September 1975

Present: Prof. M. RUBIN (Chairman), Prof. P. LOUS (Secretary), Prof. D. H. CURNOW, Dr. M. ROTH (Titular Members); Prof. A. DEFALQUE, Dr. C. J. PORTER (Associate Members); Prof. M. M. ABDEL KADER, Mr. G. KALLAND (Observers).

1. Joint Meetings with Committee on Teaching of Chemistry

The meeting on 3 September was a joint meeting of the Commission with the IUPAC Committee on Teaching of Chemistry. This meeting was chaired by Prof. C. N. R. RAO, Chairman of the Committee on Teaching of Chemistry. Five Members of the above mentioned committee were present.

Prof. RUBIN introduced the meeting by describing the function of clinical chemistry, stressing that although the work was performed in the health field, methods from many different branches of chemistry were utilized and also that the chemists working in clinical chemistry were educated in many different ways, and that only a few universities had special teaching programmes for this discipline. Prof. RUBIN thereafter described how the commission recently had compiled a monograph, especially related to the teaching of future directors of clinical chemistry laboratories (departments). A proposal had now been made for establishing in a few selected chemistry teaching institutes — preferentially in developing countries — courses for clinical chemistry teaching, aiming especially at the function of chemist or senior chemical technologist in clinical chemistry laboratories. In the following discussion several problems were clarified and methodology of chemistry teaching was briefly touched upon.

Another joint meeting of the Commission with the Committee on Teaching of Chemistry was held on 5 September. The meeting was headed by Prof. RAO; about 12 Members of the Committee were present. Prof. CURNOW proposed the formation of an *ad hoc* committee to look at the possibilities for common action and this proposal was met with approval. During the discussion it was also mentioned that clinical chemistry perhaps could assist chemical institutions by illustrative experiments from clinical chemistry to be performed in practical classes, thereby also stimulating the interest of chemists in this branch. Prof. RAO offered space in *International Newsletter on Chemical Education* for a description of the education and functions of the clinical chemist, as an information to the academic chemistry teaching community.

2. Status of Various Projects

The meeting on 4 September gave consideration to several matters arising from meetings with the Committee on Teaching. Commission also dealt with the following:

- (i) The minutes of the meeting in Munich on 19-21 April 1974 [see *Inf. Bull.* No. 48 (October 1974), page 36] were approved.
- (ii) The cooperation with the Committee of IFCC on Teaching was proceeding smoothly — a report of the meeting during the Toronto Congress between the officers of the Commission and the members of the IFCC Committee was given.
- (iii) The WHO activity regarding teaching of quality control was recorded.
- (iv) The status about the Commission's monograph on Clinical Chemistry was reported. IUPAC would publish part of it in the near future. The IFCC publication committee was investigating printing possibilities.
- (v) Some details about the proposal presented to Committee on Teaching of Chemistry were clarified, especially the different titles used in different countries to individuals who had the same function and/or the same education and training.

3. Membership

As a result of elections by secret ballot held on 4 September the Commission had the following membership:

Titular Members: D. CURNOW (Australia), Chairman (1975-79); J. PORTER (Canada), Secretary (1975-79); M. ROTH (Switzerland) (1975-79); M. SCHWARTZ (USA) (1975-79); P. LOUS (Denmark) (1975-77).

Associate Members: A. DEFALQUE (Belgium); M. M. ABDEL KADER (Egypt); A. LATNER (UK); P. LOUISOT (France); M. RUBIN (USA).

All the Associate Members were elected for a 2-year period.

4. Other Future Activities

The Commission proposed to take up the projects: 'Establishing guidelines for courses in quality control' and 'Collection of existing rules in different countries regarding technicians' education and authorization'.

5. Next Meeting and Budget for 1976

The next meeting was proposed to be held in England in 1976. The sum needed to bring the Titular Members to England for a 2-day meeting was estimated at US-\$1550, the secretarial expenses to about US-\$150 — in all about US-\$1700 would be needed for 1976.

COMMISSION ON TOXICOLOGY (CToCC)

4–6 September 1975

Present: Prof. F. W. SUNDERMAN, Jr., (Chairman), Dr. S. S. BROWN, Prof. R. BOURDON, Prof. M. J. G. MERCIER (Titular Members); Dr. H. E. SPIEGEL, Dr. D. B. TONKS (Associate Members); Dr. J. C. NIXON (Canadian National Representative) and Mr. R. J. M. RATCLIFFE (Trans World Conference Organizers, Ltd.) attended the Meeting in part as Observers.

1. Minutes of Previous Meeting

The minutes of the meeting held in Toronto on 16 July 1975 [see *Inf. Bull.* Nos. 50/51 (November 1975), pages 128–129] were approved after a minor amendment.

2. International Symposium on Clinical Chemistry and Chemical Toxicology of Metals

Commission unanimously decided that the Symposium would be held on 3–5 March 1977 at the International Convention Center in Monte Carlo, Monaco. Commission discussed at length and agreed on a draft which was to be printed as First Circular under Dr. BROWN's supervision and widely distributed.

The purpose of the Symposium was to provide an international forum for interchange and dissemination of current information regarding the clinical chemistry and chemical toxicology of metals. Attention would be focused primarily upon recent research, and opportunity provided for interdisciplinary exchange of ideas, attitudes and perspectives. Four toxic metals – cadmium, lead, mercury and nickel – had been selected to exemplify the following principal topics: (a) Routes of exposure, sites of accumulation, and mechanisms of detoxification and excretion; (b) biochemical aspects of renal, skeletal, hematological, neurological, pulmonary, hepatic and endocrine toxicities, as well as carcinogenicity; (c) trace metal analyses in biological materials, including reference materials and methods, monitoring of analytical performance and interlaboratory variations; and (d) applications of chemical tests in population screening, clinical diagnosis, prognosis and therapy of metal poisoning in man. The Symposium was to be organized into five scientific sessions: (a) fundamental aspects of metal toxicology; (b) analysis of metals in biological materials; (c) clinical biochemistry of cadmium and mercury poisonings; (d) clinical biochemistry of lead and nickel

poisonings; and (e) reference materials and methods, quality control, proficiency testing, and interlaboratory variations of metal analyses in clinical laboratories.

Commission decided that the Second Circular and Abstract Form would be distributed about 15 March 1976, with a deadline of 1 October 1976 for the receipt of abstracts and for payment of the registration fee at a reduced rate. The contents of the Second Circular would be drafted by Dr. SUNDERMAN and the Abstract Form by Dr. BROWN. Dr. SPIEGEL summarized the arrangements for presentation of commercial exhibits at the Symposium, as described in the minutes of the previous ComTox Meeting in Toronto. Dr. TONKS reported that no change was envisaged in the budget for the International Symposium, as approved at the previous ComTox Meeting in Toronto. Dr. TONKS was delegated full authority to solicit financial sponsorship for the Symposium from governmental, scientific and industrial organizations. Dr. BROWN indicated that he was actively negotiating with Pergamon Press regarding the publication of the Symposium proceedings. Dr. SUNDERMAN reported that the Commission's invitation to IFCC for cosponsorship of the Symposium had been favourably received. Commission unanimously approved the addition of Dr. M. RUBIN (USA) as a member of the Organizing Committee for the Symposium, in order to maintain liaison with IFCC. Dr. SUNDERMAN listed possible international and national organizations that might potentially be interested in the Symposium, including IUPHAR; World Society of Pathology – Committee on Standards (WASP/COWS); SCOPE; Permanent Commission and International Association on Occupational Health (PCIAOH); CEE; and WHO. Dr. SUNDERMAN volunteered to contact these organizations in order to obtain publicity for the meeting and to explore possible cosponsorship.

3. General Programme of Commission on Toxicology

As a consequence of extensive informal discussions within the Commission, Dr. SUNDERMAN presented the following general programme for the next 6 years which was to place particular emphasis upon (a) metal toxicity during 1975–77; (b) mass spectrometry/gas chromatography of drugs, toxic agents and metabolites during 1977–79; and (c) chemical indices of organspecific toxicity during 1979–81, with particular reference to renal, hepatic, **pulmonary and hematological injury from toxic agents**. International Symposia would be sponsored by the Commission on these topics at 2-year

intervals. Based upon the recommendation of the plenary lecturers and participants at these Symposia, the Commission would formulate specific recommendations on reference methods, materials, standardization and interlaboratory comparisons which could be published in the Technical Reports (blue booklets) series of IUPAC. Inasmuch as the first Symposium on toxic metals will be held in March 1977, the Commission should be ready to formulate recommendations on metal toxicity during the next IUPAC Conference (1977). During the 1977 Conference, the International Symposium on Mass Spectroscopy/Gas Chromatography of Drugs and Toxic Agents in Biological Fluids would begin to be organized, with attention focused upon extraction and derivitization techniques, methods of mass fragmentography, and data processing procedures.

A second major facet of the general programme of the Commission would be to prepare review articles on timely topics in chemical toxicology. As a result of proposals by Drs. BROWN and SUNDERMAN, the organization of three sub-committees was approved for the following topics: (i) measurements of serum cholinesterases; (ii) atomic absorption spectrometry of lead in blood; and (iii) environmental and occupational toxicology of nickel. Creation of these subcommittees was envisaged as a means of expanding the scope and impact of the Commission's activities. Owing to shortages of funds, the work of the subcommittees would need to be accomplished primarily by correspondence. Nonetheless, it was anticipated that the subcommittees would function effectively if the chairmen were members of the Commission on Toxicology, and if they played paramount roles in selecting the members and organizing the work of their subcommittees.

A third major facet of the general programme of the Commission would be to serve as an international panel for consultation and advice upon toxicological aspects of clinical chemistry. In particular, the Commission had accepted an invitation to review environmental criteria documents on metals and other toxic agents which were being drafted by WHO, and to review proposed specifications for specimen containers and collection procedures (especially as they apply to diagnostic toxicology).

In order to cope with these various activities, and in order to help IUPAC to play an increasingly effective role in environmental, occupational and clinical toxicology, the Commission unanimously approved a request to the Section on Clinical Chemistry for appointment of (a) two additional Titular Members in 1979 (bringing the total to 6) and (b) two additional Titular Members in 1981 (bringing the total to 8).

4. Establishment of Subcommittees

1. Dr. BROWN volunteered to serve as Chairman of the Subcommittee on Measurements of Human Serum Cholinesterases. The Subcommittee would be assigned the task of formulating a review article on the current status of this important topic. Dr. Brown will recruit the members of his Subcommittee. Possible candidates that were proposed for his consideration included: Dr. P. F. GIBSON (UK), Dr. C. WORONICK (USA), Dr. W. KALOW (Canada), Dr. W. PILZ (Federal Republic of Germany), and Dr. A. MOTULSKY (USA). Dr. SPIEGEL (USA) volunteered to serve as the Commission member responsible for arranging for external review of the recommendations of the Subcommittee on Cholinesterase.

2. Dr. BOURDON volunteered to serve as Chairman of the Subcommittee on Atomic Absorption Spectrometry of Lead in Blood. The Subcommittee would be assigned the task of formulating a review article in French on the current status of this topic. Dr. BOURDON would recruit members of his Subcommittee. Possible candidates that were proposed for his consideration included: Dr. R. WARD (UK), Dr. D. TONKS (Canada), Dr. A. CERNIK (UK), Dr. R. LAUWERYS (Belgium), Dr. J. SAVORY (USA), and Dr. SCHALLER (Federal Republic of Germany). Dr. M. MERCIER (Belgium) volunteered to serve as the Commission member responsible for arranging for external review of the recommendation of the Subcommittee.

3. Dr. SUNDERMAN volunteered to serve as Chairman of the Subcommittee on Environmental and Occupational Toxicology of Nickel. The Subcommittee would be assigned the task of formulating a review article on measurements of nickel in biological materials. Dr. SUNDERMAN will recruit the members of his Subcommittee. Possible candidates that were proposed for his consideration included: Dr. M. McNEELY (Canada), Dr. S. NOMOTO (Japan), Dr. T. NORSETH (Norway), Dr. K. KASPRZAK (Poland), and Dr. L. MORGAN (UK). Dr. SAVORY would be asked to serve as the Commission member to arrange for external review of the recommendation of the Subcommittee on Nickel.

4. Review of Subcommittee Recommendations and Reports. To assure quality control of the recommendations and reports of Subcommittees of the Commission Dr. SUNDERMAN proposed the following procedure for review of all documents from the subcommissions that were intended for external distribution or publication. Step A: A draft document will be sent by the Subcommittee Chairman to the Commission Chairman, who will circulate the draft document to Members of the Commission for initial review.

Step B: Depending on the results of Step A, the document will either be returned to the Subcommittee for revision or it will be sent by a member of the Commission to two external authorities for anonymous review. Step C: Depending upon the results of Step C, the document will either be returned to the Subcommittee for revision or it will be submitted by the Chairman of the Commission on Toxicology to the President of the Section on Clinical Chemistry for approval by the Section (Step D). It was anticipated that Steps A through D should normally be accomplished by correspondence. The entire review procedure should not require more than 3 months for completion, unless the draft document was returned to the Subcommittee for revision. After considerable discussion, this procedure for review of Subcommittee documents was unanimously approved.

5. Relationships with Other Bodies

1. International Union of Pharmacology. Dr. SPIEGEL reported on an informal expression by Dr. J. J. BURNS, President of IUPHAR, of the desirability of close cooperation and possible liaison between the Commission and the appropriate committees of IUPHAR. Such a liaison was enthusiastically received by the Commission.

2. Section on Air Quality of IUPAC. A joint meeting with Members of the Section on Air Quality was held on 4 September 1975 in order (a) to explore areas of mutual interest, (b) to establish a cordial working relationship, and (c) to prevent unnecessary overlap of activities. Drs. R. G. SMITH, S. LUXON, W. PILZ, N. ZURLO and BRODE from the Section on Air Quality attended the joint meeting. Drs. SUNDERMAN and TONKS described the plans and activities of the Commission and Drs. SMITH, LUXON and PILZ outlined the current projects of the Section on Air Quality. Dr. SMITH explained that only one of 17 projects of the Section on Air Quality was concerned with analyses of biological fluids. Dr. SUNDERMAN and Dr. TONKS expressed the willingness and concern of the Commission to review recommendations regarding analyses of biological fluids that were proposed by the Section on Air Quality. Dr. SUNDERMAN promised to refer any recommendations of the Commission that pertained to measurements of atmospheric concentrations for review by the Section on Air Quality. The Section on Air Quality and the Commission unanimously agreed to distribute their respective draft minutes to the officers of the other body. The two bodies agreed to schedule joint meetings whenever feasible, and certainly at the time of the biennial IUPAC conferences.

3. Tokyo IUPAC Congress. Dr. SUNDERMAN was authorized to contact the Congress Committee for the 1977 IUPAC Congress in Tokyo to offer participation of the Commission in the Joint Symposia on Contributions of Chemistry to the Welfare of Man.

6. Membership of the Commission

The Commission approved the nomination of Dr. MERCIER for reappointment as a Titular Member (1975–79); Dr. SPIEGEL for reappointment as an Associate Member (1975–79); Dr. TONKS for reappointment as an Associate Member (1975–79); and Dr. NOIRFALISE for reappointment as an Associate Member (1975–77).

7. Future Meetings of the Commission

The Commission approved the following schedule for future meetings: (1) Early June 1976, London (UK). (2) 6–7 December 1976, Louvain (Belgium). (3) 3–5 March 1977, Monte Carlo (Monaco). (4) August–September 1977, IUPAC Conference, Warsaw (Poland).

PHYSICAL CHEMISTRY DIVISION COMMITTEE

2 and 7 September 1975

Present: Dr. R. N. JONES (President), Prof. S. SUNNER (Vice-President), Prof. M. FAYARD (Secretary), Prof. A. R. H. COLE, Prof. R. HAASE, Prof. E. F. WESTRUM, Jr. Also present, by invitation, were: Dr. D. AMBROSE, Prof. M. A. ELYASHÉVICH, Prof. G. MILAZZO, Dr. K. J. MYSELS, Dr. R. PARSONS, Prof. N. SHEPPARD, Prof. D. H. WHIFFEN.

1. Divisional Activities

The President's Report to Council was accepted. The minutes of the meetings at Munich on 21, 26 and 27 August 1973 were approved (see *Comptes Rendus XXVII Conference: Part B*, pages 110–112).

There was a lengthy discussion of the pending implementation of the revised Statutes and Bylaws of the Union; an additional informal meeting on this topic, also attended by many of the Officers of the Commissions, was held on 4 September. The Division had depended extensively on Subcommissions to implement its technical programmes. It was agreed unanimously that all the extant Subcommissions of the Division should be reconstituted as Subcommittees of the Division for a 2-year period. It was also recommended that the Secretariat be requested to publish the names and addresses of the Members serving on these Subcommittees in the *Comptes Rendus* in accord with the provisions of Minute 19/74 of the XXXIV Bureau Meeting at Brussels. This was considered to be necessary to ensure that the work of the Subcommittee Members was appropriately acknowledged and to aid them to obtain release of time and to secure travel and subsistence expenses from sources outside IUPAC.

A draft version of the new Rules of the Division had been circulated to the Members prior to the meeting; it was discussed and given informal approval. It was agreed that formal adoption should be postponed until the new Statutes and Bylaws of the Union had been adopted by Council. A major change in the new Divisional Rules was the procedure for the nomination and election of Members to the Division Committee. The new election procedure was used at Madrid on an evaluation basis.

In the discussion of the budgets for 1973–75 and 1975–77 it was noted that where funds were allocated to Commissions for specific projects it was desirable that the President be notified of the funds actually dispersed at the earliest opportunity so that any unused balance could be returned to the

Contingency Fund for other purposes.

Increasing cooperation with the Commissions of other Divisions was noted. The Division is now represented on Commission III.2 by Prof. COLE and on Commission III.3 by Prof. TURNER (both with Associate Member status). The Division Committee viewed with favour the proposal of the Organic Chemistry Division to reconstitute Commission III.3 on a broader basis as an alternative to the formation of a separate and additional Inter-divisional Committee for Photochemistry. The Physical Chemistry Division Committee will also cooperate with the International Company Associates Group concerning future activity in the field of heterogeneous catalysis. Closer relations between Commissions I.3 and V.5 are discussed elsewhere in this report. The absence of any group in IUPAC representative of the broad aspects of chemical kinetics was again noted and it was recommended that the Division Committee draw this to the attention of some prominent chemical kineticists to ascertain their views.

2. Commission Activities

Details of the Commission activities are recorded elsewhere in the *Comptes Rendus* in the minutes of the respective Commission meetings and in the report of the Division President. At the 28th Conference the following documents concerned with nomenclature, symbolism and data presentation had been approved by the Division Committee and referred to the Secretariat for appropriate action.

For submission as final recommendations for publication in *Pure and Applied Chemistry*:

- (i) Recommendations on Nomenclature and Conventions for Reporting Mössbauer Spectroscopic Data (Commission I.5) [Provisional version published as Appendix No. 33 (August 1973) to *Inf. Bull.*]
- (ii) Recommendations for Nomenclature and Spectral Presentation in Electron Spectroscopy Resulting from Excitation by Photons (Commission I.5) [Provisional version published as Appendix No. 37 (August 1974) to *Inf. Bull.*]
- (iii) Recommendations for the Presentation of NMR Data for Publication in Chemical Journals — B. Conventions Relating to Spectra from Nuclei Other than Protons (Commission I.5) [Provisional version published as Appendix No. 38 (August 1974) to *Inf. Bull.*]
- (iv) Definitions, Terminology and Symbols in Colloid and Surface Chemistry

— Part II. Heterogeneous Catalysis (Commission I.6) [Provisional version published as Appendix No. 39 (August 1974) to *Inf. Bull.*]

For publication as provisional recommendations in Appendices to the *Information Bulletin*:

- (i) Expression of Results in Quantum Chemistry (Commission I.1).
- (ii) Recommendations for Symbolism and Nomenclature in Mass Spectroscopy (Commission I.5).
- (iii) Recommendations for the Presentation of Infrared Absorption Spectra in Data Collections (Commission I.5).
- (iv) Definition and Symbolism of Molecular Force Constants (Commission I.5).
- (v) Reporting Experimental Data Dealing with Critical Micellization Concentrations (c.m.c.'s) (Commission I.6).

Commission I.1. The relation between Commission I.1 and the reconstituted Interdivisional Committee on Nomenclature and Symbols (IDCNS) was discussed; it was agreed that the President nominate two Members of Commission I.1 to represent the Division on the IDCNS. It was also agreed that all documents involving symbols and units generated within the Division should be referred to Commission I.1 before submission for publication and that Commission I.1 should act as the medium for clearing all such documents with the IDCNS. Commission I.1 took note of the proposal from Commission I.5 to act on the proliferation of abbreviations in the literature of chemical spectroscopy and it agreed to examine the broader aspects of this problem in other areas of physical chemistry. Commission I.1 reported that it considered there was no need to act on the proposal from CODATA concerning symbols for physicochemical quantities in limited character sets as this field was adequately covered by the definitive document ISO 2955. The CODATA Task Group on Computer Use would be informed of this decision.

Commission I.2. The Division Committee took note of the increasing productivity of the Thermodynamics Tables Project and the interest this is now generating in the industrial sector. It supported the representation to the Bureau and Council that the royalty arrangements with the Thermodynamics Tables Project Centre be continued on the present basis. It also noted the increasing activity in plasma chemistry and the strongly expressed wish for the establishment of a separate commission on plasma chemistry. The Division Committee gave its support for a Fifth International Conference on Chemical Thermodynamics to be held at Lund, Sweden in 1977.

Commission I.3. The Division Committee supported the proposal to form a joint subcommittee between Commissions I.3 and V.5. It felt strongly that closer liaison between the two Commissions was necessary and noted with approval the suggestion by the Chairman of Commission I.5 that the formation of this subcommittee might be a first step towards the ultimate fusion of the two Commissions. The Division Committee endorsed the sponsorship by IUPAC of the I.S.E. Meeting to be held at Zürich in 1976.

Commission I.4. The Division Committee approved the proposal to hold a meeting of the Commission in 1976 to expedite the completion of the work of the Subcommittee on Calibration and Test Materials. It recommended that future documents in this series be submitted to Commission I.1 prior to publication to check on the consistence of the units and symbols with IUPAC practice. The Division Committee also supported the collaboration with BIPM and IAPS in regard to work on the redetermination of the density of water. It agreed to submit to the Bureau the proposals from Commission I.4 relating to the publication of the 'Catalog of Reference Materials from National Standards Laboratories'.

Commission I.5. The Division Committee agreed on the need for prompt action concerning symbols, terminology and data presentation in optical rotatory dispersion, circular dichroism and related fields. It supported the proposal for the formation of a subcommittee to deal with this; such a subcommittee should be limited to a four-year period and should include representation from the Inorganic, Organic and Analytical Divisions should they so request. The Division Committee complemented Commission I.5 on the completion of the enlarged and updated second edition of *Tables of Wavenumbers for the Calibration of Infrared Spectrometers* and recommended that Prof. COLE's name be attached to the publication and adequate acknowledgement be made of the contributions of the other contributing authors. It also proposed that consideration be given, prior to the next meeting, to extend the scope of the Subcommittee on the Storage and Retrieval of Spectral Data to provide a broader base for technical liaison with CODATA.

Commission I.6. The Division Committee noted the publication of *Physical Chemistry: Enriching Topics From Colloid and Surface Chemistry* and commented on the good quality of the volume in relation to its low published price. Release of the publication rights by IUPAC had been approved at the XXVIIth Conference. This publication represented a new departure for the Physical Chemistry Division into the area of chemical education and the Division Committee expressed the wish that IUPAC bodies would take steps

to promote the distribution of the book.

3. Membership

As noted above, a new procedure for the election of Members to the Division Committee was used. This provided for nominations by the membership at large in addition to the slate of candidates selected by a Nominating Committee (Prof. D. H. EVERETT, Prof. A. PEREZ-MASIA, Prof. S. SUNNER and Dr. G. WADDINGTON). Five candidates were nominated for the three vacancies on the Division Committee and Dr. D. AMBROSE, Dr. K. J. MYSELS and Prof. N. SHEPPARD were elected by ballot at Madrid.

The new membership was as follows: Dr. R. N. JONES (President), Dr. G. WADDINGTON (Past-President), Prof. S. SUNNER (Vice-President and President-Elect), Prof. M. FAYARD (Secretary); Members: Dr. D. AMBROSE, Prof. L. V. GURVICH, Dr. R. HAASE, Dr. K. J. MYSELS, Prof. N. SHEPPARD, Prof. E. F. WESTRUM, Jr.

The results of the elections for Commission Members and Commission Officers (reported elsewhere in the *Comptes Rendus*) were discussed and approved.

COMMISSION ON PHYSICOCHEMICAL SYMBOLS, TERMINOLOGY, AND UNITS (I.1)

2 and 6 September 1975

Present: Prof. D. H. WHIFFEN (Chairman), Prof. M. FAYARD (Secretary), Prof. V. KELLÖ, Prof. J. KOEFOED, Dr. D. R. LIDE, Prof. A. PEREZ-MASIA, Dr. A. SCHUIJFF, Prof. K. G. WEIL (Titular Members); Prof. M. L. McGLASHAN, Dr. M. A. PAUL (Associate Members).

1. Minutes of Previous Meeting

These had been published in *Comptes Rendus XXVII Conference – Part B*, pages 113–115.

2. Publication of Nomenclature Recommendations

The Commission was glad to note the publication of the second edition of the *Manual of Symbols and Terminology for Physicochemical Quantities and Units*, regretted its high price, and thanked Dr. PAUL for his work in preparing this edition for press. It approved for publication as an appendix to the Manual 'Definitions, Terminology, and Symbols in Colloid and Surface Chemistry – Part II. Heterogeneous Catalysis' as prepared by Commission I.6 based on a revision of the provisional recommendations published as Appendix No. 39 (August 1974) to *Inf. Bull.* It approved 'Expression of Results in Quantum Chemistry' for publication in provisional form as an Appendix to *Inf. Bull.*

The Commission was determined to give consideration to the problem of listing standard abbreviations and acronyms in use in chemistry. It also noted the lack of attention given to the terminology of kinetic processes in the *Manual* and its Appendices.

3. Membership

Commission recommended the reappointment of Prof. J. KOEFOED, Dr. D. R. LIDE, Dr. A. SCHUIJFF, Prof. K. G. WEIL and Prof. D. H. WHIFFEN as Titular Members for a further period of 4 years, 1975–1979. Commission reappointed Prof. WHIFFEN as Chairman and appointed Prof. WEIL as Secretary for the 4-year period.

It recommended the appointment of Dr. I. ANSARA (France) as a Titular Member for 1975–79; reappointment of Prof. M. L. McGLASHAN and Mr. J. TERRIEN as Associate Members, and the transference of Prof.

PEREZ-MASÍA to Associate Membership.

Commission thanked M. FAYARD, retiring Secretary, for his work in this position.

COMMISSION ON THERMODYNAMICS AND THERMOCHEMISTRY (I.2)

3, 5 and 6 September 1975

Present: Prof. E. F. WESTRUM, Jr. (Chairman), Prof. M. LAFFITTEE (Secretary), Dr. C. W. BECKETT, Dr. J. D. COX, Prof. S. SEKI, Dr. I. WÄDSE (Titular Members); Dr. S. ANGUS, Prof. F. KOHLER, Prof. G. M. SCHNEIDER, Prof. Y. TAKAHASHI (Associate Members). Prof. COLOMINA, Prof. F. D. ROSSINI and Prof. S. SUNNER attended as Observers in part.

1. Minutes of Previous Meeting

The minutes of the meeting held on 22–25 August 1973 in Munich (see *Comptes Rendus XXVII Conference – Part B*, pages 116–122) were approved.

2. Symbols, Units, Nomenclature

Dr. COX had distributed a report on the subject. After discussion it was agreed that a new Appendix to *Manual of Symbols and Terminology for Physicochemical Quantities and Units* was needed concerned particularly with chemical thermodynamics. The Commission decided to set up a continuing committee under the Chairmanship of Dr. COX who will complete the revision of the Appendix. Drs. WANDERZEE and WHALLAY and a representative of Commission II.3 would seek accord on certain controversial points. Commission decided to seek funds to have a joint meeting, if necessary, with Commission I.1. The following were agreed after discussion.

For the *state of aggregation*, single letters were designated for the principal states: g for gas, l for liquid, s for solid. Also designated: fl for fluid, lc for liquid crystal, or for crystalline, am for amorphous, vit for vitreous (vt also proposed was abandoned). For solution, no decision was taken (sl, sln, sol, **soln had been proposed**); ls and ss had been suggested for liquid and solid solution respectively, but no agreement had been reached; aq was agreed for aqueous solution; ads was agreed for the adsorbed state.

For the notation for changes of states and changes of variables, two systems ought to be permitted: the traditional way and the symbol $\Delta_{\alpha}^{\beta} X$ (meaning the magnitude of the property X for state β less the magnitude of X for state α), with not too much enthusiasm about this last symbolism. The subscript fus was agreed for melting (fusion), also sub for sublimation, vap for vaporization, tr for transition (it was said that the context could

avoid confusion with translation, transformation . . .).

For the *standard state*, agreement only for the superscript ° designation was reached: confusion with the degree sign used for temperature now little used in thermodynamics was minimal; the symbol ° had disappeared. There was a long discussion about the standard pressure: should 1 atm be abandoned and instead 1 Pa, 10^5 Pa, 10^6 Pa used? No change was decided and 1 atm = 101 325 Pa would continue to be the standard pressure. Two members argued that a distinction in symbolism between intensive and extensive properties would be desirable, at least for pedagogical reasons. More controversial matters arose from a "Gallup poll" compiled by J. D. COX, which would be discussed further after the present meeting.

3. Physicochemical Measurements and Standards. Calibration and Test Materials

Commission I.4.1 had asked the Commission to help it with enthalpy and Dr. COX had been appointed the nominee. A report by the group concerned had been published in 1974 in *Pure Appl. Chem.* vol. **40** (3), 399–450 under the title: 'Recommended Reference Materials for Realization of Physicochemical Properties. Section: Enthalpy'.

4. Guide for Publication of Thermodynamic Data

In response to a question of Prof. WESTRUM, it was agreed that revision of the *Guide* was not necessary. The question of subdisciplinary supplements was also discussed, but action seemed necessary.

5. Temperature and Pressure Scales

No report had been prepared on progress in the definition of the '*temperature scale*'. Dr. VODAR had sent a written comment, saying: "Please note that under AIRAPT, an Associate organization of IUPAC, a task group on *Pressure scale* was set up at Kyoto, November 1974, and confirmed formally in Moscow, May 1975. It is under the chairmanship of Dr. MERRIL (USA) and covers both the medium high pressure range and the very high-pressure range."

6. Subcommittee on Plasma Chemistry

Prof. SUHR presented a 12-page report of the Plasma Chemistry Subcommittee I.2.1 which had been very active and had wanted that it be accorded the status of Commission within Physical Chemistry Division. If change of the

plasma group into a Commission could not be achieved at the present time and the group was to continue its IUPAC activity then all its Members should still be listed in the Membership List part of *Comptes Rendus*. This was needed as a justification to the employers of the Members re, the group's IUPAC activity. The official recognition was also necessary to obtain permission to attend meetings like the plasma chemistry Symposia or meetings on standards. Also travelling funds, sometimes granted by government agencies, would only be available when official IUPAC recognition was given to the Members. A Report on activities during the period 1973–75, as given hereunder, was presented.

- (i) An International Symposium on Plasma Chemistry was held in 1975 in Kiel (Federal Republic of Germany). In this 4½-day meeting the attendance was about 150. There were six invited lectures and 54 contributed papers. A Second Symposium on Plasma Chemistry would be held on 18–23 September 1975 in Rome. Topics were similar to the first meeting: 4 invited lectures, 50 contributed papers.
- (ii) Committee on Standards of Measurements had met in September 1974 for a 2-day period. The Committee restricted its activities to electrically generated plasmas, with high pressures, temperatures below 15 000 K and single specie plasmas. A preliminary report and two reports had been prepared and would be discussed and possibly codified for publication at the meeting in Rome.
- (iii) *The Industrial Liaison Committee* sent out questionnaires to companies and institutes to assess the needs of industry with regard to plasma chemistry. The outcome of the about 100 answers was to be analysed in 1975.
- (iv) *A Round Table Conference on the Study of Transport Phenomena in Thermal Plasmas* prepared for September 1975 in Odeillo: 4 invited speakers, 36 contributed papers. Participation was expected to be of the order of 100.
- (v) Following *publications* came out.

The International Directory of Plasma Chemistry Research which was started in 1971 gives names, addresses and fields of research and interest of people active in plasma chemistry. During the past 2 years two supplements had been issued.

The Plasma Bulletin which provided information on new literature or on events in the field of plasma chemistry had two additional issues

published during the last two years. The industrial liaison committee had published a *list of companies* having an interest in plasma chemistry application.

The work on the *plasma bibliography* was continued. The state of the bibliography was to be discussed in Rome.

Meetings of the Members of the Subcommission. The first meeting in connection with the Kiel Symposium 1973: 8 subcommission members and 2 observers attended. The next meeting was in 1974 in New Hampshire on occasion of the Gordon Conference of Plasmachemistry: 5 members and 2 observers attended.

3rd International Symposium on Plasma Chemistry was being proposed to be held immediately before the IUPAC Congress in 1977. The location would be probably London, possibly Paris. The character of the meeting would be in part similar to the symposia in Kiel and Rome as far as the exchange of information was concerned. In addition three half-day sessions would be devoted to report results of the three committees on standards of measurements and on discussions in connection with these.

Collecting and distributing data relevant to plasma chemistry. The work on the *plasma bibliography* was to be continued but had to be reorganized. Presently more than 4000 quotations had been collected and divided into 6 major categories. *Data* necessary or useful for plasma chemistry are to be collected. Lists of such information sources would be assembled and published in the *Plasma Bulletin*.

Committee on Standards of Measurement. This Committee was first set up in 1973. The members of the Committee and of the Plasma Chemistry Subcommission felt it necessary to strongly increase the activities in this area. The present Committee had restricted its objectives to high-pressure, high-temperature plasmas. It was going to continue work for the next 2 years. It was thought necessary by the members of the subcommission to set up another committee of standards of measurements working under experimental conditions of non-equilibrium plasmas.

Industrial Liaison Committee. This Committee was created in 1973 to "assess the needs of industry in regard to Plasma Chemistry Research". The answers to the questionnaires sent to representatives of companies throughout the world, provide a good background for future action. It was felt that this committee must work separately on Thermal Plasma Applications and Non-equilibrium Plasma Applications.

7. Inter-union Commission on Biothermodynamics

Dr. WADSÖ informed the Commission that the formation of the Inter-union Commission on Biothermodynamics had now been fully agreed upon by the 3 Unions (IUB, IUPAB, IUPAC). Prof. W. WHELAN (Secretary General of IUB) had been acting as a contact between the Unions and the Commission.

The Commission still lacked written rules about its structure, function, and financial provision. A proposal on these subjects would be submitted to the Unions very soon.

Recently (August 21–22) the Inter-union Commission held a meeting in Zürich wherein the document entitled “Recommendations for measurement and presentation of biochemical equilibrium data” was finalized for publication as a Provisional Nomenclature Appendix to the *IUPAC Inf. Bull.*

Future projects included a compilation of thermodynamic data for ligand-protein binding processes. The Commission would hopefully be able to initiate compilation work on thermodynamic data for simple biochemical model compounds. In addition the Commission planned to prepare a small textbook on biothermodynamics as a complement volume to existing classical thermodynamic texts. Prof. WESTRUM expressed the hope of the Commission I.2 that this Inter-union Commission would be productive soon.

8. International Data Series (IDS). Fluid Mixtures Tables

Dr. H. V. KEHIAIAN reported on the current status of the International Data Series (IDS). He distributed a preliminary issue of IDS, Series A (Thermodynamic Properties of Organic Mixtures) and anticipated the publication of this series by the Thermodynamic Research Center (TRC) of the Texas A&M University (TAMU) and the completion of a preliminary issue of IDS, Series D (Thermodynamic Properties of Alloys) by 1975.

IDS(A) was a well-known regular publication. Five issues, containing 350 tables, had been edited at the Centre de Recherches de Microcalorimetrie et de Thermochemie (CRMT) du Centre National de la Recherche Scientifique (CNRS) and published and distributed by TRC-TAMU. The publication was the result of an international cooperative programme. The IDS(A) Editorial Board was composed of the following 11 Members: Prof. M. M. ABBOTT (USA), Dr. G. C. BENSON (Canada), Prof. P. FRANZOSINI (Italy), Dr. H. V. KEHIAIAN (Editor-in-Chief, France), Dr. A. KREGLEWSKI (USA), Dr. S. MALANOWSKI (Poland), Prof. K. N. MARSH (Australia), Dr. I. A. McLURE (UK), Prof. H. C. VAN NESS (USA), Prof. A. G. WILLIAMSON (New

Zealand), and Dr. C. L. YOUNG (Australia). Prof. B. J. ZWOLINSKI was acting as Executive Officer. The properties considered in IDS(A) include excess enthalpies, excess volumes, excess Gibbs energies, liquid-vapour and liquid-liquid equilibria, and liquid-gas critical parameters.

Dr. KEHIAIAN presented also the preliminary IDS(D) issue which was prepared at the CRMT-CNRS by Drs. R. CASTANET and C. BERGMAN and distributed in August 1975 to participants of the 4th International Conference on Thermodynamics (Montpellier, France). Contacts had recently been established with Prof. C. B. ALCOCK, Chairman of Commission II.3. The nomination of the IDS(D) Editorial Board was expected to be done by Commission II.3.

It was anticipated that the following will be completed by 1977:

- (i) The publication of six new IDS(A) issues containing 500 additional tables and the extension of the property list to include heat capacities, solid-liquid equilibria, and measurements under high pressure.
- (ii) The preparation of a revised and enlarged IDS(D) issue containing 100 tables.
- (iii) The preparation of a preliminary IDS issue, Series B (aqueous-organic systems), and of a preliminary IDS issue, Series C (organic and inorganic fluids of major scientific and technological interest).
- (iv) The availability of the numerical information contained in IDS tables in computer readable format in order to facilitate the transmission of data from IDS to Data Evaluation Centers and Data Banks.

During the discussions, Dr. ANGUS noted that IDS was not competitive in any sense with the endeavours of the IUPAC Thermodynamic Tables Project Center and that the launching of IDS(C) would be of great help to the Center. Prof. MARSH commented that many IDS tables had been reporting previously unpublished results, IDS becoming thus a true primary publication. To the question raised by Dr. COX as to how IDS is referred in the secondary literature, Dr. KEHIAIAN stated that IDS tables were abstracted in *Chemical Abstracts* and indexed in the IUPAC *Bulletin of Thermodynamics and Thermochemistry*.

Referring to the IUPAC Solubility Data Project (SDP), Dr. KEHIAIAN expressed the hope that ways of cooperation between SDP and IDS will be found in the future.

In conclusion, the Commission noted with satisfaction the successful development of IDS during the past 2 years under the direction of Dr. KEHIAIAN and expressed its appreciation to Prof. M. LAFFITTE and to

Prof. B. J. ZWOLINSKI for their support.

9. CODATA Task Group on Key Values for Chemical Thermodynamics

Dr. COX presented the results of the deliberations of the Task Group he chairs. In the appendix 5 are reported the CODATA *Recommended Key Values* for 1975 and the CODATA *Tentative Key Values*, part V.

The Task Group was concerned with the production of recommended values for the quantities $\Delta H_f^\circ(298.15\text{ K})$, $S^\circ(298.15\text{ K})$ and $H^\circ(298.15\text{ K}) - H^\circ(0)$ for species of key importance in thermodynamics. These are taken as the elements in their standard states and as gaseous atoms. Also considered were certain oxides, halides, aqueous ions and other species important in thermochemical measurements. These recommended values might eventually provide the foundation for the production of International Tables of Thermodynamic Properties for a comprehensive range of species.

Recommended values for 55 key species were published in *J. Chem. Thermodynamics*, 7, 1(1975), and data for the following additional species would be published in the *CODATA Bulletin*:

F(g), F-(aq), F₂(g), HF(g), Si(c), Si(g), SiO₂(c, α -quartz),
SiF₄(g), B(c), B(g), B₂O₃(c), BF₃(g), Al(c), Al(g),
Al₂O₃(c, corundum), Zn²⁺(aq), ZnO(c), Cu(c), Cu(g).

The properties of the above species had previously been published as *tentative* values in *CODATA Bulletins*. Comments from experts outside the group were taken into consideration in the production of recommended values, during a meeting of the Task Group in Moscow in April 1975.

Following the same policy, a Tentative Set of Key Values for Thermodynamics — Part V would be published in the *CODATA Bulletin* and was to contain values for the following species:

Si(c), SO₄²⁻(aq), P(c, white), P(g), P₂(g), P₄(g), P₄O₁₀(c, hexagonal),
Th(c), Th(g), ThO₂(c), U(c), U(g), UO₂(c), UO₂²⁺(aq), UO₃(c), U₃O₈(c),
AlF₃(c), Cu²⁺(aq), CuSO₄(c), Be(c), Be(g), BeO(c), Mg(c), Mg(g),
Mg²⁺(aq), MgO(c), MgF₂(c), Ca(c), Ca(g), Ca²⁺(aq), CaO(c).

Also, data on the following species would be considered during 1975:

Hg(l), Hg(g), Hg²⁺(aq), HgO(c), Hg₂SO₄(c), HgCl₂(c), Cd(c), Cd(g),
Cd²⁺(aq), CdO(c), CdSO₄ 8/3 H₂O(c), Sn(c), Sn(g), Sn²⁺(aq), Pb(c),
Pb(g), Pb²⁺(aq), PbO(c), PbSO₄(c), NO₃⁻(aq), CO₃²⁻(aq).

It would be greatly appreciated by the Task Group if researchers who have completed relevant measurements, calculations or assessments on species in the above two sets would communicate with any of the members of the Task Group.

The *decision* had been taken to accept the values for the recommended key values for chemical thermodynamics and to thank the Task Group for their continuing endeavour.

10. Status of Major Publications

(i) *Experimental Thermodynamics, Volume II*. The book had been edited by Prof. B. VODAR and Dr. B. Le NEINDRE. Owing to the publisher's oversight the names of the editors had not been printed on the cover although they had been included on the title page. Commission hoped that in future greater recognition would be given to the Editors. Another complaint was that the size of the book was too large and the strength of the binding was inadequate. The Commission thanked Prof. VODAR and Dr. Le NEINDRE for the completion of this very impressive Volume II of *Experimental Thermodynamics* devoted to non-reacting fluids.

(ii) *Experimental Thermochemistry, Volume III (or Chemical Thermodynamics, Volume I)*. The editor, Prof. SUNNER, reported on the progress that had been made, mainly through correspondence and during two meetings held at Montpellier, during the 4th International Conference on Chemical Thermodynamics, where a large proportion of the contributors to the Volume had been present. Commission felt that the book was in good hands and awaited its publication.

(iii) *Reaction Calorimetry (Experimental Thermochemistry, Volume IV or Chemical Thermodynamics, Volume II)*. From the replies to a circular letter from Prof. WESTRUM, it was difficult to say if a new volume was necessary. For many chapters, little subsequent development had occurred. The commissioning of a book on reaction calorimetry and non-calorimetric evaluations of ΔG 's and ΔH 's (EMF, effusion, mass spectrometric methods, etc.) needed further consideration.

(iv) *Journal of Chemical Thermodynamics*. The policy of the Journal had been to appoint members of the Advisory Board for a period of 3 years. Profs. BENSON, LAFFITTE and SUNNER were due to finish their terms at the end of 1975. They would be replaced by Prof. MARSH, Prof. DIAZ PEÑA and Dr. GRAVELLE. Drs. GURVICH, YAKIC and Prof. KOHLER would serve

up to the end of 1976. Profs. BREWER, SCHNEIDER, SWINTON, TAKAHASHI and VANDERZEE will serve up to the end of 1977, etc.

Prof. KOHLER reported that Dr. BECKER for Elsevier had sent to him a letter asking about the possibility of publishing a journal on liquid vapor equilibria. Prof. KOHLER had replied that according to him such a publication would not appear. The Commission had agreed.

11. Third International Conference on Chemical Thermodynamics

Prof. KOHLER said that an official report on the Conference (held in Badenbei-Wien, Austria, in September 1973) had already been published in the *IUPAC Inf. Bull.* No. 47 (March 1974). The Commission agreed with him upon the quality of the scientific programme of the Conference. Prof. KOHLER also said that he had been satisfied that at Baden the two groups of physicochemical and inorganic thermodynamicists came into close contact (sections chaired by Prof. KOMAREK and Prof. NECKEL and symposium chaired by Prof. ALCOCK). The Commission expressed concern at the extraordinary delay in the publication of plenary lectures; it hoped that it would be done more quickly for the next Conference.

12. Fourth International Conference on Chemical Thermodynamics

This Conference had recently been held (Montpellier, France: 26–30 August 1975) and a report would be prepared for publication (scheduled for publication in *IUPAC Inf. Bull.* No. 52). Eight plenary lectures were to be published in the journal *Pure and Applied Chemistry* as well as a separate conference volume.

13. IAPS Conference

This Conference held in Giens (Var), France, in 1975 had covered the properties of water and steam (and also, to some extent, ices) at various temperatures and pressures; a session had dealt with dilute aqueous solutions. Experimental methods for the measurement of thermodynamic and transport properties (in general, and only for water) were presented by experts in the form of survey papers. The new President of IAPS was Prof. J. KESTIN (USA), the next IAPS Conference (in 1979), was likely to take place in the Federal Republic of Germany.

Summary of AIRAPT Activities. 4th International Conference on High Pressures. 25–28 November 1974, Kyoto, Japan.

1st International Conference on Crystal Growth under Pressure (mainly hydrothermal crystal growth); co-sponsored by Groupement Français de Croissance Cristalline, Le Creusot, France, 9–11 October 1975.

Preparation of an AIRAPT Newsletter (mailed separately).

5th International Conference on High Pressures, co-sponsored by the Academy of Sciences of USSR, Moscow, USSR, 25–31 May 1975.

2nd Conference on High Pressure Engineering, co-sponsored by AIRAPT, Brighton, UK, 8–11 July 1975.

Task Group on High-pressure Scale and High-pressure data.

A first discussion on these problems was started at the Kyoto Conference (Panel); the resolutions taken were confirmed and extended in 1975 in **Moscow**:

Pressure scale. Chairman: Dr. L. MERILL, USA (Utah).

Data on High Pressure Phase of Solids. Convener: B. VODAR (France).

Data on Hydrocarbons. Convener: Dr. PRAUSNITZ (USA).

Liaison with IUPAC and CODATA was made by informing Dr. E. WESTRUM.

Establishment, thanks to the help of the City of Le Creusot, France, of a (small) "Permanent Secretariat" at the "Château de la Verrerie".

5. Membership: for about 250 persons.

6. New Officers:

Honorary Member: B. VODAR (France), President: D. PUGH (UK), Vice-Presidents: U. FRANCK (FRG), J. OSUGI (Japan), Secretary-general: B. VODAR (France), Treasurer: E. WHALLEY (Canada).

7. Next Conference: 1977: place undecided (it is hoped in the USA or Canada).

8. Decision, taken in Moscow, to establish a Prize for outstanding work on High Pressures by an individual or a group, to be called "Bridgman Prize" and be granted normally at the time of each General International Conference (2 years sequence presently); if appropriate sponsorship is obtained, a Medal will be granted at this occasion.

14. Reports from National Societies on Thermodynamics

(i) *Society of Calorimetry and Chemical Analysis, Japan.* Prof. SEKI reported that the Society had 662 regular members and 46 company

associates. Annual Conferences of the Society were held – the 11th Conference was scheduled for 19–21 November 1975 in which foreign lecturers[Prof. O. J. KLEPPA (USA) and Prof. L. G. HEPLER (Canada)] had been invited as in the past years. An official journal, *Netsu-sokutei* (calorimetry), had been published quarterly since 1974. A review book entitled *Heat, Temperature, and Thermal Analysis* was published annually.

(ii) *Association Française de Calorimétrie et d'Analyse Thermique (AFCAT) and Groupe de Thermodynamique Expérimentale (GTE) of Société Chimiques de France*. These societies organized separate and joint conferences. The last joint conference was held on 9–10 May 1974 at Université de Rennes. Some members of the “Thermal Methods Group” of the Society for Analytical Chemistry (UK) were present. Of the 166 participants, 40 were from other countries. Calibration in calorimetry and in thermal analysis took up two sessions. The third session was devoted to the determination, by calorimetry and thermal analysis, of thermodynamic data associated with phase transformations. The fourth session comprised contributed lectures in inorganic chemistry and in organic chemistry. Two booklets had been published giving the texts of the lectures. These were available from: Secrétariat de l'AFCAT, CRMT c/o Melle L. Chevalier, 26 rue du 141e RIA, F-13003 Marseille.

The annual meeting of AFCAT was held in Grenoble on 22–23 May 1974. Approximately 170 participants were present, of whom 20 were foreigners. Sessions were devoted to: low-temperature calorimetry; study of condensed phases at ambient and high temperatures – phase transitions, and thermodynamic data acquisition. A booklet had been published giving the texts of the lectures and is available from Secrétariat de l'AFCAT.

The meeting – Journées d'Odeillo, Odeillo, France, 25–26 April 1975 – was organized by the Laboratoire des Ultra-réfractaires du CNRS and was sponsored by the Société des Hautes Températures et Réfractaires and GTE. The main theme was: “Study of physicochemical properties at high temperatures ($T > 1400^{\circ}\text{C}$) of solid and liquids; experimental aspects.” A round table was held on the high-temperature calorimetry.

The summer School on Calorimetry and Experimental Thermodynamics would be held from 23–27 September 1975 on the premises

of the University of Nice. The field of work covered by the School would be extraordinarily large since it would start from the study of different recuperable sources of energy right up to the thermics of chemical engineering, the properties of composite materials, passing by metallurgical thermodynamics, molecular thermodynamics, thermometry, infra-red radiometry, with a general discussion on geothermics by the well-known volcanologist, H. TAZIEFF, director of research at the CNRS, who would also be showing one of his films. In the course of the week, the participants will have the opportunity to try for themselves, at a rate of four times 2½ hours, the material put at their disposal by the manufacturers. The organizer is M. L. ELÉGANT, Laboratoire de Chimie physique organique, Université de Nice, Parc Valrose, 06034 Nice Cedex, and the sponsorship is offered by the AFCAT.

Summer School on Stability Constants. Bivigliano, Italy. 10–15 June 1974. The Italian group entitled "Thermodynamics of Complexes", under the auspices of the Italian Association of Inorganic Chemistry, organized an International Summer School on "Stability Constants" which was held at Bivigliano (20 km from Florence). The programme included the following topics: experimental problems in the determination of stability constants; graphical methods; computer programmes; calorimetric studies; interactions in electrolyte solutions; solution stability of metal complexes; biological systems.

The organizer was Prof. P. PAOLETTI, Istituto de Chimica Generale, Via I. Nardi, 39 50133 Firenze, Italy.

12th Conference on Continuous Weighing in Controlled Atmospheres Lyon, France, September 1974. Organized by the Laboratoire de Chimie Appliquée and the Laboratoire de Génie Chimique de l'Université Claude Bernard, under the control of Prof. C. EYRAUD; this Conference attracted some 110 participants. Four themes were discussed: sensitivity and accuracy of thermobalances; use and adaptation of thermobalances; technical problems; field of application of gravimetric datum; coupling and association of thermo-analytical methods. More than 40 lectures and conferences were held, the texts of which are available (as long as stock lasts) from: Laboratoire de Génie Chimique et de Chimie Appliquée; B.P. 6 010; 69604 Villeurbanne, France.

15. Forthcoming Thermodynamics Conferences

Thermodynamics and Calorimetric Studies of Systems of Biological Interest.

Genova, Italy. 5–9 April 1976. This symposium will be organized by Prof. G. RIALDI, of the Istituto di Chimica Industriale, Via Pastore 3, 16132 Genova, Italy, from whom any information may be obtained and to whom inscriptions should be addressed.

The conferences and working sessions will deal with calorimetric techniques, the thermodynamic studies of models and complex biologic processes, the thermodynamics of macromolecular interactions and transitions in proteins, nucleic acids, carbohydrates, etc.

International Round Table on Study and Applications of Transport Phenomena in Thermal Plasmas. Odeillo, France. 12–16 September 1975. Prof. LAFFITTE reported that this so-called meeting will be held at Odeillo, France (Laboratoire des Ultra Réfractaires du CNRS), under the sponsorship of IUPAC and CNRS with the financial support of French CNRS, Electricité de France and local authorities. About 80 participants are expected from 18 countries; 36 contributions will be presented, dealing with the various topics defined in each session.

For the first session on Large-scale Plasma Heating organized by J. MILLET (France) the invited speaker is Dr. P. H. WILKS (USA). For the second session on Heat Transfer to Condensed Phases, organized by Dr. LAWTON (UK), the invited speaker is Prof. E. PFENDER (USA). For the third session on Simultaneous Heat and Mass Transfer, organized by Dr. GAUVIN (Canada), the invited speaker is Dr. I. G. SAYCE (UK). For the fourth session, organized by Dr. B. WALDIE (UK), the invited speaker is Prof. N. N. RYKALIN (USSR). Dr. M. FOEX will chair the meeting, Dr. C. BONET being the editor. A lot of time is planned to be devoted to discussions. Among the points to be discussed in length will be: the future of plasma chemistry applications; the new applications to be considered; the prediction of transport phenomena.

Vth European Conference on Thermophysical Properties of Solids at High Temperatures. Moscow, USSR. 18–21 May 1976. (The information on this Conference had come to the Secretariat after the Madrid meeting.) The list of topics will cover fundamental problems related to studies of thermophysical properties of substances in the solid state at high temperature. The Conference will be held in Moscow, 18–21 May 1976 (3 days devoted to the ordinary sessions, 1 day to visits of research laboratories).

Forthcoming meetings in Japan. Prof. SEKI reported that the Vth International

Conference on Thermal Analysis will be held in Kyoto, 3–7 August 1977. Information may be requested from N. MATSUMOTO, 1.5.31, Yushima, Bunkyo, Tokyo; Tel: 03.815.3988. The 13th Japanese Calorimetry Conference will be joint with this Vth ICTA, with a special session on Calorimetry and Analytical Calorimetry.

Forthcoming meetings in France. Prof. LAFFITTE reported that the 1976 “Journées de Calorimétrie et d’Analyse Thermique” de l’AFCAT (French Society of Thermal Engineers) will be held in Besançon, 13–14 May 1976. Information may be requested from Dr. J. C. REGGIANI, Laboratoire de Chimie Physique, Faculté des Sciences, 32 rue Mégevand, 25000 Besançon, France.

Prof. LAFFITTE also reported that the French Society of Thermal Engineers (SFT) will hold its annual Convention at Grenoble, 24–26 May 1976, on the topic “Thermal aspects of current energy problems”. Inquiry for details may be sought from M. PERDON, Secrétaire, SFT, 28 rue de la Source, 75016 Paris, France.

16. Intergroup Meetings

Solubility Task Group. Dr. J. D. COX reported briefly on an informal joint meeting of Subcommittee I.2.2 (Thermodynamic Tables) with Subcommittee V.6.1 (Solubility Data Project), held on 3 September 1975. Several members of Commissions I.2 and V.6 had attended the meeting. The Subcommittees had exchanged with interest information provided by Dr. COX (I.2.2) and Prof. A. S. KERTES (V.6.1) on the scope and progress of their respective projects. The view was expressed that there is no overlap between the present activities of the Subcommittees. Dr. H. V. KEHIAIAN, commenting on this point, said that some overlap may occur in the future when Subcommittee I.2.2 starts work on fluid *mixtures*.

17. Membership

Two Titular Members, Prof. S. SEKI and Dr. B. VODAR, will be terminated upon expiration of their present term. The following individuals were to be requested advancement to Titular Membership with the terms indicated: Prof. G. M. SCHNEIDER (FRG), 4 years; Prof. Y. TAKAHASHI (Japan), 4 years.

The following individuals presently associate members will be terminated upon expiration of their present term (1975): Prof. HÁLA, Prof. ROWLINSON.

The following individuals are to be requested for appointment to associate membership for a 2-year term (1975–77): Prof. M. DIAZ-PEN~A (Spain); Prof. FRANSOZINI (Italy); Prof. VANDERZEE (USA); Prof. ZIELENKIEWIVZ (Poland).

National Representative. Prof. LAFFITTE received in July 1975 an official letter from the President of the Akademie der Wissenschaften der DDR (acting as the DDR Adhering Organization), Prof. KEIL, asking for approval by the Commission of the nomination of Prof. Dr. M. RÄTZSCH (Miss) as the DDR National representative. The Commission approved this nomination. According to the By-laws of the IUPAC "Such representation shall lapse at the conclusion of the next General Assembly unless the person is renominated by the Adhering Organization and reapproved by the Commission".

SUBCOMMISSION ON THERMODYNAMIC TABLES (I.2.2)

4 September 1975

Present: Dr. J. D. COX (Chairman), Dr. H. J. WHITE, Jr. (Secretary), Dr. S. ANGUS, Dr. H. V. KEHIAIAN.

1. Minutes of Previous Meeting and Matters Arising

The minutes of the meeting held at Munich on 25 August 1973 (see *Comptes Rendus XXVII Conference – Part B*, pages 123–126) were approved.

Objectives of the Subcommission. No formal objectives had been received from Commission I.2. The Subcommission preferred to work from the base of its established responsibilities with respect to the Thermodynamic Tables Project and allow added responsibilities to develop from this base and from coordination with other IUPAC bodies. Pending instructions to the contrary the Subcommission would proceed in this manner.

List of Thermodynamic Tabulation Projects. The Chairman's letter to CODATA requesting a listing of relevant projects from the CODATA files and encouraging CODATA to continue compiling such data had not been answered. The Secretary had been instructed to contact CODATA again in this regard. It should be noted parenthetically that through conversations with CODATA officers at the meeting, the Secretary was able to determine that CODATA had renewed its efforts and was preparing a new compilation to replace its International Compendium of Numerical Data Projects (1969) which was out of date. Dr. D. LIDE of the National Bureau of Standards, Washington, DC 20234 on behalf of CODATA had asked that all Members of the Subcommission inform him of relevant data compilation activities. An appropriate information form would be available shortly.

Correspondents to the Subcommission. It was announced that the following had accepted the Chairman's invitation to become correspondents to the Subcommission: Prof. J. OSUGI, Prof. K. WATANABE, Prof. D. S. VISWANATH, Dr. A. D. KOZLOV, Prof. B. J. ZWOLINSKI, Prof. D. M. NEWITT, Prof. J. KESTIN.

The Secretary was instructed to draft letters expressing the Subcommission's pleasure at their willingness to serve and answering any questions that might have been raised. Dr. COX would write to each Correspondent to determine his current data compilation activities and interests.

Natural Gas. At the time of the last meeting a proposed purchase agreement

between the US and the USSR involving Soviet natural gas suggested the need for an internationally agreed upon PVT formulation for natural gas, and Dr. ANGUS had offered the services of the Project Centre for this purpose. The response received had suggested that the trade agreement had not sufficiently developed at the time to make it clear that a formulation would be needed. In the interim period, the trade agreement appeared not to have developed further, and an internationally funded cooperative project on the properties of liquified natural gas had been started at the National Bureau of Standards in Boulder, Colorado. Because of these developments, this initiative had to be abandoned.

2. Report on documents issued during 1973–75

Proposal for additional IUPAC funds. At the Munich meeting in 1973, a motion requesting support for the Thermodynamics Tables Project from the IUPAC Special Projects Funds had been prepared and forwarded to Commission I.2 which had endorsed it and sent it to the Physical Chemistry Division for further endorsement and forwarding to higher echelons. Nothing further had been heard of this motion. It was decided that the Chairman should ask Commission I.2 to inquire about its fate.

Mid-term Newsletter. A mid-term newsletter on the activities of the Subcommission had been prepared and sent out on 1 October 1974. The Commission agreed that this was a useful activity and that it should be continued.

3. Thermodynamic Tables Project Centre

Progress of Technical Work during 1973–75. Substantial progress had been made toward tables for a number of fluids in the period since the previous meeting of the Subcommission. The current status of the work was as follows:

(i) Tables approved or published:

Argon — published. CO₂ — in press.

Ethylene — published. N₂ — approved.

(ii) Tables in preparation by Centre, or materials for such tables available:

CH₄ — Centre preparing a table.

NH₃ — Two formulations available for consideration.

He — Tables in last stages of preparation.

H₂ — Two reviews are underway.

(iii) Activities leading to reviews underway in various locations:

Air, oxygen, ethane, propane, propylene, butane.

(iv) Substances identified with the project not currently being actively pursued:

Halogenated hydrocarbons, neon, krypton, xenon, aromatic hydrocarbons.

Further details were given in the report, 'A Review of the Work of the IUPAC Thermodynamic Tables Project' by S. ANGUS, PC/R30, July 1975, which had been made available to Members of the Subcommission and Commission I.2 and would be mailed to all participants in the Tables Project.

Carbon monoxide was brought up in discussion. Dr. ANGUS reported that he had been unable to find workers interested in preparing a review of the data on this substance. He was encouraged to continue to attempt to get work started on this fluid.

The 'Guide to the Correlation of Thermodynamic Data' was welcomed as an important activity of the Project, and the Project Centre was encouraged to carry on with it.

Funding, Staffing, Publicity, Visits. The most important and encouraging development had been the acceptance of responsibility for the Project Centre by the Science Research Council (SRC) of the United Kingdom. A supplemental grant by OSTI took care of the Centre's deficit, and funding at the present level of staffing seems assured for the immediate future. Although a small increase in staff would be very useful, it was unlikely that this matter could be raised before September 1976, at the earliest.

Royalties from the sale of books had also been transferred from IUPAC to the Project Centre. SRC required that one-half of these royalties be used to reduce the cost to SRC of the Centre; the other half was available without condition for use by the Centre. Although the sums are not large, the return of royalties to the Project Centre was taken as an indication of the health and vigour of the programme by SRC and, hence, was important to the well-being of the Project Centre. Although IUPAC had recently been transferring royalties to the Project Centre, it was not clear whether or not the transfer would be continued. The Subcommission wished to go on record as requesting that the transfer be continued since it was a matter of importance to the SRC. The matter was to be raised at the joint meeting of Commission I.2 and Subcommission I.2.2.

The SRC also provided the Project Centre with a separate travel budget which allowed for one trip to the United States per year.

The Industrial Subscribers constituted another source of income while an

'invisible' source was Imperial College, which provided free accommodation and computing to the Project Centre.

Industrial Sponsorship and User Recognition of Tables. The staff of the Project Centre hoped to bring additional companies into the Industrial Subscription Scheme. In this connexion, it was to be noted that Drs. COX and ANGUS were invited to attend the meeting of the Company Associates of IUPAC to explain the Thermodynamic Tables Project and discuss ways in which the Company Associates might support the Project and help it develop. Several ideas were discussed including expansion of the Industrial Subscription Scheme, secondment of staff and release of data from company files. Dr. ANGUS agreed to write up the discussion in more detail and to circulate it to the Company Associates.

Work Programme 1975-77 and Possible New Approaches to Tabulations of PVT Data. The programme of the Thermodynamic Tables Project for the period in question was as follows:

- (i) Construct thermodynamic tables for nitrogen, helium, and methane; and prepare monographs incorporating these tables for publication.
- (ii) Continue critical assessment of data for air, oxygen, hydrogen and ammonia in collaboration with other organizations.
- (iii) Plan for assessing data on propane, propene halogenated hydrocarbons, neon, krypton, and xenon.
- (iv) Monitor the results of the project underway in the USA to develop a new formulation for the properties of ethylene with a view to deciding whether a revision of '*International Thermodynamic Tables of the Fluid State, Ethylene, 1972*' was warranted.
- (v) Assess the needs for critical evaluation of the data for other fluids and, in particular, carbon monoxide.
- (vi) Plan a meeting of members of Working Panels.

Dr. COX proposed, and the members present endorsed, a commendation to the staff of the Project Centre for the high quality of their performance. This would not only refer to the superior technical quality of the tables which had been published but also the vigour and skill with which they had brought about the coordination of related activities the world over. This coordination enabled the Project to reap the benefits of efforts worth many times the costs of the Project Centre and maintain an overall level of activity far beyond what could be accomplished by the Project Centre alone.

4. Consideration of Cognate Activities

International Data Series: Selected Data on Mixtures. A preliminary version of a volume in the A Series was circulated at Munich. A total of 5 volumes had now been published covering 350 systems with a cumulative subject index. Some of the experimental data covered were otherwise unpublished or published in an incomplete or overly condensed form. Each system published was to be noted in *Chemicals Abstracts*. The first volume of the D Series on alloys edited by Prof. M. LAFFITTE had been printed. As yet, no editors had been appointed for Series B on aqueous systems or Series C on cryogenic fluids. Expansion into these areas would require the right person to act as editor, and a positive assessment as to need in these areas. Series C might serve as a repository for data from industry and evaluated data. The Subcommittee wished to go on record as supporting the Series and the exploration of its further development.

IUPAC Project on Solubility: Liaison with Subcommittee V.6.1. A joint meeting between Subcommissions I.2.2 and V.6.1 was held. The Chairmen spoke briefly of the activities and plans of their respective subcommissions. It was agreed that the activities of the two subcommissions were not duplicative as currently constituted. It was noted that Subcommittee V.6.1 might seek the assistance of I.2.2 in data evaluation at some future time, and it was decided to consult with Commission I.2 on this point.

Liaison with Subcommittee I.4.1. Subcommittee I.4.1 was concerned with the orthobaric densities and vapour pressures of a variety of fluids which might serve as standards for the calibration of instruments. At the request of Dr. AMBROSE of I.4.1, Dr. ANGUS provided information on a number of fluids.

Liaison with the International Association for the Properties of Steam. The International Association for the Properties of Steam (IAPS) had been concerned historically with the thermodynamic properties of steam needed to use steam as a working fluid in power generation. In this respect, their interest in steam paralleled the interest of the Project Centre in other fluids. More recently, the IAPS had become interested in the chemical thermodynamics of power cycles as well. Liaison between I.2.2 and the IAPS was good. Dr. ANGUS was Chairman of the UK Committee on the Properties of Steam and represented the Project Centre at IAPS. Dr. WHITE was Executive Secretary of IAPS.

5. Possible Future Activities

Heat Capacities. The Project Centre had need for data on heat capacities from time to time but did not have the personnel needed for compilation and evaluation of the experimental data. It was agreed that a survey of activities of this type would be desirable and that members should try to find someone suitable to make such a survey. A start would be made by Dr. WHITE.

Transport Properties. Dr. ANGUS had sought the advice of several people in connexion with initiation of a committee on transport properties. It was agreed that an international committee on the data on viscosity and thermal conductivity would be useful. It was agreed that the work should start with the dilute gasphase of monoatomic gases and that one group should consider the data on all fluids. The project should be parallel to, but not part of, the Thermodynamic Tables Project, and should not involve the staff of the Project Centre as long as the staff was limited to its present size. The matter was to be discussed at the joint meeting with Commission I.2.

Plan of M. DENNERY for Formulating Scope and Setting Priorities for the Subcommission. An English translation of Mr. DENNERY's plan has been prepared and approved by Mr. DENNERY and made available by the Project Centre. It was noted that the activities of the Thermodynamic Tables Project to date had all been in accord with the principles adduced by Mr. DENNERY.

Plan of Prof. NEWITT for Activities with UNISIST. This plan was discussed at the previous meeting of the Commission. The plan was put into proper form for submission and sent to UNISIST. No answer had been received from UNISIST and action on the plan was pending. It was known that UNISIST had sent the plan to CODATA for comment. Dr. ANGUS would discuss this matter with Prof. WESTRUM in his capacity as Secretary General of CODATA.

6. Membership

The Subcommission learned that Mr. DENNERY had received a new assignment from his company and felt that he must resign from the Subcommission to devote all of his efforts to his new tasks. The Subcommission accepted Mr. DENNERY's resignation with thanks for his services and regrets at his leaving and wished him well in his new assignment. Dr. COX was to discuss with the Chairman of I.2 a possible replacement for Mr. DENNERY.

COMMISSION ON ELECTROCHEMISTRY (I.3)

3, 5, 6 September 1975

Present: Prof. R. HAASE (Chairman), Dr. R. PARSONS (Vice-chairman), Prof. G. MILAZZO (Secretary), Prof. I. EPELBOIN, Prof. N. IBL, Prof. A. SANFELD, Dr. R. TAMAMUSHI, Prof. E. YEAGER (Titular Members); Dr. R. A. DURST, Dr. J. C. JUSTICE (Associate Members); Prof. S. MINC (National Representative, Poland).

1. The minutes of the previous meeting (Brighton, UK: 20–21 September 1974) had been published in *Inf. Bull.* No. 49 (March 1975), pages 66–68.

2. Profs. HAASE and MILAZZO had completed their terms as Chairman and Secretary of the Commission (at the end of Madrid Conference) and clarification had been sought from IUPAC as to whether they should continue with the organization of the forthcoming Colloquium on "Electrochemistry in Non-isothermal Systems". IUPAC had no objection. Prof. MILAZZO then asked whether it was the intention of the Commission to leave the organization in the hands of Prof. HAASE and Prof. MILAZZO or to entrust it to somebody else. The Commission unanimously (abstention of Prof. HAASE and Prof. MILAZZO) decided for the continuation of the organization by HAASE and MILAZZO. The latter then reported on the preparation of the meeting. About 130 electrochemists had been asked about their interest in this Colloquium and the answer was: 63 yes, 10 no, from the others no answer had been received. About a dozen of the persons consulted offered to read individual communication. On the basis of this favourable result it was decided to hold the Colloquium on 9–10 September 1976, conjointly with the General Meeting of the International Society of Electrochemistry (ISE) at Zürich. It was then decided that Prof. MILAZZO should contact the Organizing Committee of the ISE Meeting about the details.

In principle three or possibly four invited lectures would be delivered by specialists in the various fields preceded by an introduction by the secretary of the Organizing Committee of this Colloquium. Prof. HAASE and Prof. MILAZZO were charged to contact distinguished specialists for the plenary lectures. During the Colloquium about 20 individual papers could be read and discussed. The Colloquium would be closed by the Chairman of the Organizing Committee who will summarize the meeting.

3. Following the decision taken at the Brighton meeting, Prof. YEAGER

contacted some colleagues about the perspectives of a joint body for physical, analytical and engineering electrochemistry. It was recognized that it was too early for this project but it was suggested that Commission V.5 and the Division Committee should be asked about the formation of a Coordinating Subcommittee constituted by the Chairmen and the Secretaries of the Commissions I.3 and V.5 and by two other members, one elected by each Commission. This Subcommittee should coordinate the work of both Commissions, stimulate cooperation and avoid overlap.

4. The Report on Interfacial Phenomena by Prof. SANFELD was then discussed. It was decided to continue this project in cooperation with Commission I.6.

Dr. JUSTICE presented his report on Conductance Data. On the basis of the discussion Dr. JUSTICE would prepare a definitive form of this report containing the equations suitable for the calculation of the conductivity of symmetric electrolytes (investigated up to date) as a function of the concentration and of the temperature in various solvents. In the meantime the present report will be distributed for preliminary criticism and comments to Commissions I.4 and V.5.

The report on the Standardization of pH-scales was given by Dr. DURST. The Commission accepted this report and decided to ask formally Commission V.5 for cooperation on the problem of pH and related quantities.

Dr. PARSONS then presented his report on "Electrode Reactions, Rate Constants and Transfer Coefficients". The various criticisms and comments expressed by Members of the Commission and by colleagues outside the Commission would be considered in redrafting this report.

Prof. IBL presented a report on "Transport Phenomena in Electrolytic Systems". This report in a second draft, based on the present discussions and written comments, to be sent to Prof. IBL within 3 months, would be discussed by correspondence.

5. Future activities of the Commission were considered in two categories: short-term and long-term. In the first, the following projects were selected:

- (i) pH Scales and Related Problems (in cooperation with Commission V.5).
- (ii) Interfacial Phenomena and in Particular Surface Chemical Physics of Solids (in cooperation with Commission I.6).
- (iii) Transport Properties of Electrolytes including Conductance Data.
- (iv) Electrochemical Kinetics and in Particular Rate Constants and Transfer Coefficients (nomenclature and possibly tabulation of data).

- (v) Compilation of Critical Tables Concerned with Electrochemical Kinetics was to be the continuation of the project (of Dr. TAMAMUSHI) on the extensive tables already published. This would be mainly carried out by the Japanese group created *ad hoc* in Japan.
- (vii) Compilation of Critical Tables Concerning Electrode Potential and Related Thermodynamic Quantities. Prof. YEAGER was charged to prepare a document for future action. This would be the continuation of the project (of Prof. MILAZZO) on the extensive tables which were being processed for printing.
- (viii) Inhibitors. This theme could be approached advantageously by contacting Prof. TRABABELLI who organized periodical meetings at Ferrara (Italy) on this subject. Prof. EPELBOIN would prepare a report on the next meeting in this series to be held in the very near future.

6. As long-term activities, it was decided to consider the following fields: bioelectrochemistry and electrochemical engineering. The activity in these fields could be accomplished for the time being by means of cooperation with the organizing committees of meetings in these domains.

7. Two joint meetings were held with Commissions I.6 and V.5. In the joint meeting between Commissions I.3 and I.6 on 4 September, the major topic of discussion was the proposal presented by Prof. HAUL for a report on 'recommendations of terminology definitions, symbols and units in the field of chemical physics of solids'. It was agreed that this was an important area of physical chemistry, which had undergone recent rapid development and whose interest would continue to grow. Commission I.6 had already decided to devote a substantial effort to this subject. Other considerable areas of mutual interest to both Commissions were also recognized and the Members of I.3 considered that their Commission should take an active part in the projects of common interest. It was agreed that a joint Subcommittee be set up to further this work. Prof. BURWELL raised then the question of a name for quantities divided by area and recommended the suggestion of Prof. EVERETT, viz. "areal" (cf. lineal, volumal, etc.). After a short discussion it was agreed that this was a reasonable suggestion.

8. During the joint meeting with Commission V.5, first of all the document by Prof. COETZEE on "Transport Activity Coefficients" was discussed in view of unfortunate overlap with Appendix 3 of the IUPAC *Manual of*

Symbols and Terminology for Physicochemical Properties and Units. After some discussion a compromise solution was reached and it was agreed that Prof. COETZEE would rewrite this document.

Secondly, the document "Manual of Terms, Symbols and Definitions for Electroanalytical Chemistry" was discussed. This document would be redrafted taking into account the criticism and the suggestions advanced.

Prof. HAASE then advocated the question of forming a coordinating group between Commissions I.3 and V.5 (see item 3). This proposal was accepted by Commission V.5 and it was decided that the chairmen of both Commissions report on this point to the respective Division Committees.

The projects of both Commissions were then illustrated by the Secretaries of both Commissions to facilitate future cooperation.

As a result of the two joint meetings, the Commission decided to ask the Division for authorization to hold an intermediary meeting at Zürich on occasion of the Colloquium on "Electrochemistry in Non-isothermal Systems" and to support financially meetings of the coordinating Subcommittees with Commissions V.5 and I.6.

9. Election of Members. The Secretary had read the names of candidates proposed by Members of the Commission and each candidate illustrated briefly his proposals. The elections were then carried out considering that Prof. SANFELD automatically continued his membership up to 1977, that Prof. IBL, Dr. PARSONS and Prof. YEAGER could be reelected for another 4-year term and others were not re-eligible as Titular Members. Concerning Associate Members, all were to be elected. Officers were elected in the election subsequent to the election of Members. The new membership is as follows: Prof. N. IBL (Chairman), Dr. R. PARSONS (Vice-chairman), Dr. J. C. JUSTICE (Secretary), Prof. K. E. HEUSLER, Prof. J. KÛTA, Prof. A. SANFELD, Prof. S. TRASATTI, Prof. E. YEAGER (Titular Members); Dr. R. DURST, Prof. I. EPELBOIN, Dr. M. FROMENT, Prof. R. HAASE, Prof. H. HOLTAN, Dr. K. NIKI, Dr. R. TAMAMUSHI (Associate Members).

Prof. YEAGER proposed a vote of thanks to the retiring officers of the Commission for their efficient and fruitful services. This vote was passed unanimously.

COMMISSION ON PHYSICOCHEMICAL MEASUREMENTS AND STANDARDS (I.4)

3–6 September 1975

Present: Dr. D. AMBROSE (Chairman), Dr. J. P. CALI (Vice-Chairman and Secretary); Dr. E. BRUNNER, Dr. J. E. LANE, Dr. Y. MASHIKO, Prof. T. PLEBANSKI (Titular Members); Prof. H. FEUERBERG, Dr. E. JUHÁSZ, Prof. H. KIENITZ (Associate Members); Mr. A. NEWTON (National Representative); Dr. G. GIRARD (Observer).

1. The minutes of the previous meeting (Munich: 22–25 August 1973) had been published in *Comptes Rendus XXVII Conference – Part B*, pages 129–131.

2. Dr. CALI reported that publication of the Proceedings of the Ottawa Purity Symposium of 1961 by NBS was in hand but no publication date could yet be forecast.

3. Dr. AMBROSE reported that uncertainty about the vapour pressure of water at the triple point and upwards to 25°C was still not completely resolved and reference would be made to this fact when the revised table was published as part of the pressure-volume-temperature section in the Recommendations to be published by Subcommission I.4.1.

4. As had been agreed at the XXVII Conference, a case had been prepared by Dr. BROWN and Dr. AMBROSE urging a cooperative programme of work on the redetermination of the density of water. This had been distributed at the end of 1974 to some 50 standards laboratories and individual scientists known to be interested in the subject, and responsibility for coordinating any responses to the suggestion had been assumed by Dr. TERRIEN on behalf of BIPM. As a result of correspondence in connection with this recommendation Dr. AMBROSE had established liaison with the International Association for the Properties of Steam (IAPS) whose president, Prof. J. KESTIN, had invited him to attend a meeting of the appropriate working party in April of this year. As a result, Dr. G. GIRARD had attended on behalf of the Commission and reported what had taken place. The essential differences between the two approaches were that the Members of IAPS believed the temperature range adopted by this Commission for consideration, 0–40°C, was too narrow, and that their preferred equation was more satisfactory for differentiation than the power series in temperature used for generating the table of values now in press as part of the recommendations of Subcommission

I.4.1 on density. It was intended to maintain liaison with IAPS so that any future revision of the tables might be jointly discussed; liaison would also be maintained in connexion with the preceding item, the vapour pressure of water.

5. Dr. AMBROSE had distributed in February a partial draft of Recommendations for the Measurement of Vapour Pressure. The Commission agreed to request continuation of this work.

6. Dr. CALI had revised the catalogue, the title of which had now been agreed as *Physical Chemistry: Catalogue of Reference Materials from National Standards Laboratories*. With the incorporation of some additional entries presented at this meeting it was agreed that this was now ready for publication subject to Dr. CALI suggesting to the contributing laboratories that they might wish to express all numerical values in SI units, a point on which there were some inconsistencies. Methods of publication were discussed and it was agreed to request adoption of a procedure that would allow wide distribution of the catalogue, for example, by waiver of IUPAC copyright so that it could be freely reproduced in more than one journal or by allowing the contributing laboratories to publish the catalogue themselves or to purchase reprints which they would then distribute. It was agreed that appearance in *Pure and Applied Chemistry* alone would not attain the publicity necessary to achieve the object for which the catalogue had been compiled.

7. Dr. GRAHAM had sent a report on the activities of the International Confederation for Thermal Analysis (ICTA). Since the Munich meeting the Third and Fourth International Test Programmes of the ICTA Committee on Standardization had been completed. As a consequence of these, and in cooperation with the US National Bureau of Standards, two new Standard Reference Materials to serve as differential thermal analysis (DTA) temperature standards, under NBS-ICTA labels, would shortly be available. These were No. 754 — a polystyrene with a highly reproducible glass transition, and No. 757 — consisting of 1,2-dichloroethane, cyclohexane, phenyl ether and *o*-terphenyl, for calibrating the temperature scale on differential thermal analysis and related thermoanalytical equipment at temperatures below 100°C.

Current work of the ICTA Committee on Standardization included the study of temperature standards for thermogravimetry based on Curie-point measurements. The homogeneity of several alloys was being investigated, and a Fifth International Test Programme was being planned. Other work

was concerned with additional temperature standards for differential thermal analysis.

8. Dr. MASHIKO had prepared, with the assistance of Dr. K. IIZUKA, a first draft of a paper on Precision and Accuracy of Measurement. It was agreed to ask Dr. CALI and Dr. GRAHAM to assist Dr. MASHIKO in developing this work, which it was intended should have special reference to physico-chemical measurements and be illustrated by specific examples. The importance of linking this work with the use of reference materials, from the point of view both of their testing and validation and of the user, was discussed.

9. Dr. MASHIKO had drawn the attention of the Commission to Japanese Industrial Standard JIS K 0501, *General Rules for Chemical Standard Substances*, but it was agreed that this appeared to be a matter for attention by ISO rather than by this Commission.

10. Dr. CALI gave a historical survey and reported on the current status of international activities in the field of reference materials. Representatives of the various interested bodies would be meeting in Geneva early in 1976 and several Members of the Physical Chemistry Division were expected to attend in other capacities; some or all of these might be requested to represent IUPAC and report developments. Dr. JUHÁSZ had drawn attention to work by OIML which was akin to some by this Commission and it was agreed to seek more information about this; Dr. JUHÁSZ also initiated a discussion on the desirability of international cooperation in the validation of reference materials.

11. A proposal by Dr. CALI that the Commission should initiate work leading to the establishment of a IUPAC-sponsored reference material was discussed. It was agreed that this would be most likely to succeed if a national standards laboratory were to take the initiative, and Dr. CALI was requested to investigate the possibility of NBS doing so.

12. A request had been received from Working Group SC66D of the International Electrotechnical Commission (IEC) that the Commission would assist them in making recommendations of reference materials for use in calibration of instruments used in the determination of water quality. The properties in question were pH, electrical conductivity, dissolved oxygen, redox potential and specific ion concentration. The first two were covered by recommendations of Subcommission I.4.1 and it was agreed that the others should be examined with a view to making recommendations.

13. Prof. PLEBANSKI had initiated a discussion of the relations between

the Commission and CODATA and it was agreed that CODATA should be informed of data work in progress.

14. Dr. LANE raised the question of errors arising in measurements of physicochemical properties by instruments used under conditions other than those in which they had been calibrated and undertook to prepare a paper on the subject.

15. Prof. FEUERBERG had initiated a discussion of the desirability of directing a significant proportion of the work of the Commission towards industrial needs. It was agreed that this should be considered with the aim of achieving a balanced programme directed to both pure and applied chemistry.

16. It was agreed that application should be made to the Division Committee for funds that would allow a meeting of Subcommission I.4.1 to be held in 1976.

SUBCOMMISSION ON CALIBRATION AND TEST MATERIALS (I.4.1)

3–5 September 1975

Present: Dr. D. AMBROSE (as Chairman), Dr. J. P. CALI (Vice-chairman and Secretary), Dr. E. BRUNNER, Dr. E. JUHÁSZ, Prof. H. KIENITZ, Prof. G. MILAZZO (in part), Prof. T. PLEBANSKI and Mr. H. ZIEBLAND. Meetings were also attended by Prof. H. FEUERBERG, Dr. G. GIRARD, Dr. J. E. LANE, Dr. Y. MASHIKO and Mr. A. NEWTON. Dr. D. AMBROSE acted as Chairman of the meetings at the request of the Chairman of the Subcommittee, Prof. H. KIENITZ.

1. A meeting of the Subcommittee had been held in Warsaw on 1–2 October 1974 and a report of its proceedings had been published in *Information Bulletin* No. 49 (March 1975).

2. It was noted that the first five chapters of the recommendations by the Subcommittee, viz. General Introduction, Enthalpy, Optical Rotation, Surface Tension, and Optical Refraction (Refractive Index), had appeared in *Pure and Applied Chemistry*, **40**, 391 (1974), without intermediate publication as Appendices to the *Information Bulletin* since it had been agreed after the XXVII Conference that these recommendations were not nomenclature proposals. This improved procedure laid a greater responsibility on the Subcommittee to ensure that there was full consultation with all interested IUPAC bodies before submission of its work for publication. (It had been subsequently agreed by Physical Chemistry Division Committee that all future recommendations should be approved by Commission I.1)

3. The Editor, Dr. HERINGTON, had reported that one further recommendation, on density, was in the press, and another, on optical absorbance and wavelength, was being edited. The Chairman of Commissions I.5 and V.4 had been consulted with respect to the last chapter and some modifications had been made in the light of comments received.

4. The drafts of three chapters, on pressure-volume-temperature relations, pH, and molecular weight were approved for publication with the following comments:

- (i) Dr. AMBROSE would incorporate in the introduction to the pressure-volume-temperature chapter a section on the use of vapour pressure reference materials for the calibration of pressure-measuring instruments and make some changes advocated by expert correspondents he had

consulted.

- (ii) The difficulties arising because there were different national pH scales had been thoroughly discussed and it should now be possible for Dr. CALI to produce an introduction acceptable to the protagonists of the different views.
- (iii) The chapter on molecular weight, submitted by Dr. GREEN, who had been appointed team leader subsequent to the XXVII Conference, should be approved by the Macromolecular Division.

5. Drafts of the chapters on viscosity (Prof. PLEBANSKI), thermal conductivity (Mr. ZIEBLAND), vapour-liquid equilibria for testing distillation column performance (Dr. BRUNNER), reflectance (Prof. FEUERBERG), permittivity (Prof. KIENITZ), hygrometry (Prof. PLEBANSKI), electrical conductivity (Dr. JUHASZ), and temperature (Prof. KIENITZ) had been discussed and plans were made for their revision. It was agreed that the proposals for pressure (Dr. BRUNNER) should be incorporated in part in the chapter on pressure-volume-temperature relations and the remainder left in abeyance for the present.

6. Prof. KIENITZ and Mr. NEWTON undertook to make a survey of the gaps in the coverage of the recommendations with a view primarily to industrial needs.

COMMISSION ON MOLECULAR STRUCTURE AND SPECTROSCOPY (I.5)

3-6 September 1975

Present: Prof. N. SHEPPARD (Chairman), Prof. M. A. ELYASHÉVICH (Vice-chairman), Prof. F. A. MILLER (Secretary), Dr. E. D. BECKER, Prof. J. H. BEYNON, Prof. E. FLUCK, Prof. A. HADNI, Prof. G. ZERBI (Titular Members); Prof. C. N. R. RAO, Dr. D. W. TURNER (Associate Members); Prof. A. R. H. COLE, Prof. J. R. DURIG, Prof. M. L. JOSIEN, Prof. C. J. H. SCHUTTE, Mr. H. A. WILLIS, Dr. D. R. LIDE Jr., Dr. R. N. JONES, Dr. E. ROTH (Subcommission Members); J. HERRANZ, A. HIDALGO, M. MEKEWI, and T. TSUCHIYA (Observers).

1. The following three documents were approved for final publication and passed on to the Physical Chemistry Division for submission to Council for approval. All had been published as provisional recommendations and had undergone the eight months waiting period. Each document had been revised in the light of comments received.

- (i) 'Recommendations on Nomenclature and Conventions for Reporting Mössbauer Spectroscopic Data.' This had been published in August 1973 as Provisional Nomenclature Appendix No. 33 to *Inf. Bull.*
- (ii) 'Recommendations for Nomenclature and Spectral Presentation in Electron Spectroscopy Resulting from Excitation by Photons.' This had been published in August 1974 as Provisional Nomenclature Appendix No. 37 to *Inf. Bull.*
- (iii) 'Recommendations for the Presentation of NMR Data for Publication in Chemical Journals — B. Conventions Relating to Spectra from Nuclei other than Protons.' This had been published in August 1974 as Provisional Nomenclature Appendix No. 38 to *Inf. Bull.*

2. The following three documents were approved for publication as Provisional Nomenclature Appendices and passed on to the Physical Chemistry Division.

- (iv) 'Definition and Symbolism of Molecular Force Constants.'
- (v) 'Recommendations for Symbolism and Nomenclature for Mass Spectroscopy.'
- (vi) 'Recommendations for the Presentation of Infrared Absorption Spectra in Data Collections.'

Other business included the following matters.

3. It had been felt that the use of abbreviations was sometimes too frequent, and that some guidelines for authors and editors would be useful. Consequently a document 'Initialled Abbreviations in the Chemical Literature' was drawn up for initial circulation within IUPAC, and was passed on to the Physical Chemistry Division.

4. Second Edition of *Tables of Wavenumbers for the Calibration of Infrared Spectrometers*. This had been IUPAC's best-selling book, and was out of print. It had been completely revised by Prof. COLE with many new figures and tables. Parts 1 and 2 had been combined in the forthcoming Second Edition to cover the entire range 1–4300 cm⁻¹. It would be published by IUPAC as a hard-cover book. The manuscript would be completed about 1 November 1975.

5. *Symbol for Wavenumber*. $\tilde{\nu}$ was recommended in preference to σ for spectroscopic use.

6. *SI Units in Spectroscopy*. The topic was discussed, but no action was taken.

7. *Consideration of Future Activities*. On-going projects to be continued include:

(i) Mass Spectroscopy – Nomenclature and Conventions.

(ii) Force Constants – Units, Conventions for Anharmonic Potential Functions, Systematic Symmetry Coordinates.

New work would be started on:

(iii) Symbolism and Conventions in Circular Dichroism, Optical Rotatory Dispersion, and Magnetic Circular Dichroism.

(iv) Quality Standards for Raman Spectra.

(v) Collaboration with the Commission on Quantities and Units in Clinical Chemistry on a document concerning 'Optical Spectroscopy'.

(vi) (Possibly) Collaboration with CODATA on 'Key Values in Spectroscopy'.

8. *Membership*. The composition of the Commission was considered and the following recommendations were made:

(a) Titular Members. Dr. E. D. BECKER was chosen to be Chairman and Prof. G. ZERBI Secretary. Prof. V. A. KOPTYUG, Prof. C. SANDORFY, Prof. T. SHIMANOUCHI, and Dr. D. W. TURNER were nominated as new Members.

(b) Associate Members. Prof. P. DIEHL, Prof. F. DÖRR, and Dr. H. A. WILLIS were nominated.

- (c) Subcommittee I.5.1 (on Infrared and Raman Spectroscopy). Dr. J. R. DURIG was chosen to be Chairman. Prof. M. O. BULANIN, Prof. M. DELHAYE, and Dr. A. L. SMITH were nominated as new Members.
- (d) Subcommittee I.5.2 (on Storage and Retrieval of Spectroscopic Data). No change of membership, but Prof. T. SHIMANOUCI was to be the new Chairman.
- (e) Subcommittee I.5.3 (on Mass Spectroscopy). No change of membership.

COMMISSION ON COLLOID AND SURFACE CHEMISTRY (I.6)

3–6 September 1975

Present: Dr. K. J. MYSELS (Chairman), Prof. S. BRUNAUER (Vice-chairman), Prof. H. VAN OLPHEN (Secretary), Prof. R. L. BURWELL, Jr., Prof. R. HAUL, Dr. V. B. KAZANSKY, Prof. C. KEMBALL, Prof. G. SCHAY (Titular Members); Prof. J. LYKLEMA (Associate Member); Prof. W. SCHIRMER (National Representative – German Democratic Republic).

Joint sessions were held with Commission II.2 (Nomenclature of Inorganic Chemistry – Chairman only) on 3 September; with Commission I.3 (Electrochemistry) on 4 September; with Commission I.1 (Physicochemical Symbols, Terminology and Units) on 5 September; and with Commission IV.1 (Macromolecular Nomenclature) on 6 September.

1. Chairman's Opening Remarks

The Chairman noted that Physical Chemistry Division had drafted a set of rules for conducting its business, a copy of which had been distributed to Commission Members. He called attention to a memorandum from the Division President, Dr. R. N. JONES, which was distributed prior to the meeting, regarding the election of members of the Division Committee. Ballot forms were distributed and the votes were submitted to the Division.

Dr. MYSELS informed Members of the resignation of Prof. G. A. SCHUIT as Associate Member. Dr. MYSELS had sent a letter of thanks to Prof. SCHUIT for his services to the Commission, particularly in drafting the 'Heterogeneous Catalysis' Appendix to the *Manual of Symbols and Terminology for Physicochemical Quantities and Units*.

Commission stood in silence in the memory of Sir ERIK RIDEAL, the founder of the Commission, who had died on 25 September 1974.

2. Minutes of Previous Meeting

The minutes of the Commission meeting at Munich on 23–26 August 1973 (see *Comptes Rendus XXVII Conference – B*, pages 135–142) were approved.

3. Symbols, Terminology and Units

Discussion with Commission I.1. The Commission met jointly with the

following Members of Commission I.1: Prof. V. KELLÖ, Prof. J. KOEFOED, Prof. A. PEREZ MASIÁ, and Prof. K. G. WEIL. It was noted that an updated version of *Manual of Symbols and Terminology for Physicochemical Quantities and Units* had appeared. The Chairman reported on the Commission's activities requiring action by Commission I.1 at the present meeting, i.e. proposals on Heterogeneous Catalysis, Rheology, and Reporting of c.m.c. Data, and on those which were still under consideration by the Commission, i.e. proposals on Zeolites, 'Dry Electrochemistry', Light Scattering, Surfactants and Surface Activity, Liquid Crystals, and Reporting of Adsorption Data.

In a letter to the Commission Dr. R. P. COUCHMAN and Prof. D. H. EVERETT had suggested *inter alia* that the term 'areal' be adopted to mean 'per unit area'. This proposal was adopted by the task force on heterogeneous catalysis and by the Commission as a whole in preference to the term 'areic' suggested by the CQUCC (Commission on Quantities and Units of Clinical Chemistry Section) (Mr. J. C. RIGG of the CQUCC discussed this matter informally with the Commission). The need for such a term along with analogous terms such as 'lineal' and 'voluminal' was clear if the term 'specific' was to be restricted in common usage to 'divided by mass' as recommended. The proposal by the Commission met with sympathy during the discussion. [Additional individual discussions on this subject were held with Prof. D. H. WHIFFEN (Chairman I.1), and with Prof. M. L. McGLASHAN (Chairman of the Interdivisional Committee on Nomenclature and Symbols (IDCNS).] Later, Commission decided to endorse 'areal' as a recommendation to ICSU who would have to make the final decision in view of the general importance of the matter.

It was left to the discretion of the Commission to select a proper term to describe what has been called 'dispersion', i.e. the number of active sites of a catalyst surface expressed in terms of the percentage of the total number of atoms at the surface (see the following item).

With regard to the document on 'Reporting of c.m.c. Data', it was also left to the Commission to find the proper wording to describe micellar solution properties, particularly to distinguish between measured properties and their derivatives with respect to concentration.

Heterogeneous Catalysis. Prof. BURWELL's Working Party had discussed the considerable number of comments received on the proposed manual published as Provisional Nomenclature Appendix No. 39 (August 1974) to the *Inf. Bull.* A final draft was prepared and reviewed in detail by the

Commission as a whole. The current usage of the term 'dispersion' among workers in catalysis was to be discouraged and should be replaced by 'percentage exposed'. (Subsequently accepted by Prof. WHIFFEN on behalf of I.1.) The term 'areal' was incorporated with the footnote 'provisional'. The final draft was approved for submission to the Division and Council for inclusion in the series of Appendices on 'Definitions, Terminology and Symbols in Colloid and Surface Chemistry' as Part II. (The final version was approved by the Division and the Council, and is presently being prepared for publication.)

Electrochemistry. The Commission met jointly with the full Commission I.3 (Chairman: Prof. R. HAASE) to discuss the Commission's plans to move into the area of 'Surface Chemical Physics of Solids', sometimes loosely called 'dry electrochemistry', and to develop a manual on terminology, definitions, symbols, and units in this area. A provisional outline of subject-matter was presented by Prof. HAUL. Members of the Electrochemistry Commission indicated their interest in a number of the items listed, and accepted the invitation from the Commission to appoint two Members to a working party to be constituted by Commission I.6. It was recommended to invite one or two physicists with expertise in those specific areas which were not entirely within the competence of the membership of the Commissions I.3 and I.6. It had also been agreed that the time was ripe to initiate an endeavour of this kind, and it was decided to constitute the working party to draft a tentative proposal within the next 2-year period by correspondence and, if possible, at an interim meeting (see item 13). (At the Divisional meeting it became clear that Commission I.5 on Molecular Structure and Spectroscopy had some work going on in this area, and should be kept fully informed.) (Prof. R. S. HANSEN had agreed to lead the Working Party.)

Light Scattering. The Commission wished to include a section on light scattering in the Appendix, Part I, and had invited Prof. J. KRATOCHVIL to draft this section, taking cognizance of relevant terminology contained in the revised edition of the 'Green Book'. However, no draft had been submitted, and the Chairman was asked to consider alternative authors.

Rheology. The Commission met jointly with the Commission IV.1 (Macromolecular Nomenclature) represented by: Dr. K. L. LOENING (Chairman), Dr. R. B. FOX, Dr. W. RING, Prof. P. SIGWALT, Prof. P. CORRADINI, Dr. G. M. KLINE, Prof. N. A. PLATÉ and Prof. T. TSURUTA. A draft on rheological terminology and symbols was discussed by the joint Commissions,

following a preliminary discussion within Commission I.6. The draft consisted of two parts, one on 'Bulk Rheology' and one on 'Surface Rheology'. The first had been written by VAN OLPHEN in consultation with Dr. R. S. MARVIN, the Chairman of the 'International Committee on Rheology' 2 years ago. Comments had been received both from the Commission and from the International Committee. The second part was written by K. J. MYSELS in consultation with Dr. M. VAN DEN TEMPEL, and was distributed to the Commissions prior to the meeting, together with an updated version of the first part.

The part on Surface Rheology was modified in the discussions of Commission I.6. Commission IV.1 refrained from comments on this part, being outside their scope of expertise. With regard to the part on Bulk Rheology, it was pointed out by Commission IV.1 that the proposals did not take cognizance of an earlier proposal originating in the Macromolecular Division which was published in *J. Polymer Sci.*, 8, 257–277 (particularly pp. 269 and 270), 1952, as a 'Report on Nomenclature in the Field of Macromolecules' from IUPAC. Subsequently, the proposed rheological terminology was adopted by ISO in ISO Recommendation R472, *Plastics – Definition of Terms*, 3rd Edn., November 1969. In the IUPAC and ISO recommendations the terms 'relative viscosity', 'reduced viscosity', 'intrinsic viscosity', and 'inherent viscosity' had been listed as terms which were 'not recommended'. The recommended terms were respectively: 'viscosity ratio', 'viscosity number', 'limiting viscosity number', and 'logarithmic viscosity number'. The Commissions, recognizing the widespread use of the previous terminology, decided to propose continued use of both sets of terms. In addition, a new term 'relative viscosity increment' was proposed to designate what was formerly called 'specific viscosity'. The latter term should be discouraged, particularly in view of the IUPAC connotation of the term 'specific'.

These and other changes were incorporated in a new draft to be published as a Provisional Nomenclature Appendix to the *Inf. Bull.* following approval by Commission I.1 and the Division. Since I.1 did not have time to make a judgement on the draft (owing to the timing of the various sessions), the Chairman of I.1 agreed to circulate the draft to the members to solicit comments. (A clean copy was prepared and sent to Prof. WHIFFEN on 16 October 1975.) Ultimately, the proposed terminology was intended to become section 1.13 of Part I of the Appendix.

Surface Activity, Surfactants. The Secretary reported on his contacts with the International Committee on Terminology (CIT) of CID regarding

definitions on surface activity and surfactants. This Committee had provided input to Technical Committee TC 91 of ISO, resulting in ISO Recommendation 862, which was identical with *CID Vocabulary of Surface Active Agents* (2nd Edn., 1972). Since much of the terminology in these vocabularies was at variance with the Commission's accepted definitions in Appendix, Part I, the ISO recommendation was not converted into an ISO standard by ISO/TC91 when our criticism was submitted. CIT had since decided to redesign its vocabulary, taking cognizance of the IUPAC manual's definitions whenever applicable. Dr. J. BRIANT (Institut de Pétrole, Rueil-Malmaison, France) had been assigned by CIT to draft a revised manual in consultation with Commission I.6. The Secretary, who was also a member of ASTM Committee D-12 which acts for the American National Standards Institute (ANSI) on ISO/TC91, had been planning the revision with Dr. BRIANT.

Liquid Crystals. Dr. FRIBERG had been requested to draft a section on terminology in this area, but none was received for discussion at the meeting.

4. Nomenclature of Zeolites

Prior to the meeting Prof. BARRER had communicated that he had studied the comments received on Provisional Nomenclature Appendix No. 41 on 'Chemical Nomenclature and Formulation of Compositions of Synthetic and Natural Zeolites', and that at least one serious problem had not yet been resolved. Although Prof. FERNELIUS, speaking for Commission II.2, had agreed to seek approval from the Division and from Council at the Madrid meeting for a definitive version consisting of the provisional one with 'minor corrections', the Commission had decided to postpone action for 2 years in view of the fact that not all corrections might be minor. (The Chairman wrote to Prof. BARRER to ask whether he could prepare a revised draft within a year, to be circulated to members of Commissions I.6 and II.2.)

5. Reference Materials

Standard Catalyst. As a result of the discussions at the Munich meeting, the Secretary had contacted the Colloid and Surface Chemistry Group of the Society of Chemical Industry (SCI) (Dr. A. L. SMITH, Honorary Secretary) to consider the establishment of an SCI/IUPAC/Warren Springs working party to develop a standard catalyst (or catalysts). The SCI group had, according to a letter from Dr. SMITH, considered the matter in December 1973, and Prof. SING was to investigate possibilities with Prof. KEMBALL and Dr. MOSS. Since no further communication had been received, the

Chairman asked Prof. KEMBALL to explore ways and means to realize the development of standard catalysts, preferably in collaboration with the SCI-Warren Springs group. There was some pressure from IUPAC Company Associates to go ahead on such a programme. A standard catalyst would be very useful to check on kinetic methods, and very desirable for research as a true scientific material which was well characterized.

Purity standards. Dr. MYSELS mentioned that 'pure' surfactants for research purposes were now being marketed, however, some of these were still lacking in purity in some aspect or even in identity, and consequently were not suitable for research purposes. Therefore, there was a need to design both purity and identity specifications which a material ought to meet to be suitable for research purposes. Dr. MYSELS had discussed with the Division whether the Commission should embark on projects of this kind, which fell also within the purview of Commission I.4 (Physicochemical Measurements and Standards). The Division agreed that the Commission engage in this project related to surfactants and start with one specific example. Dr. MYSELS agreed to draft purity specifications for Na dodecylsulfate, and indicated that Prof. P. MUKERJEE would collaborate on the project. Commission I.4 would be kept informed about progress on the project.

6. Data Evaluation and Compilation

The Secretary reported that the output of the National Standard Reference Data System in the U.S. continues to be published in the *Journal of Physical and Chemical Reference Data*, now in its fourth year. No further compilations in the area of Colloid and Surface Chemistry had appeared since Jasper's compilation of surface tension data. The project on electrochemical and electrokinetic data headed by Prof. J. LYKLEMA had not reached the publication stage. Prof. LYKLEMA pointed out that the delay was primarily due to a serious lack of time to work on the project by Prof. OTTEWILL and Dr. PARSONS who had agreed to perform part of the work. Not only was Prof. LYKLEMA anxious to meet the terms of his contract with the National Bureau of Standards, he as well as the Commission felt that it was an important project and that there was a definite need for an evaluated data compilation in these areas. Therefore, the Commission resolved that it strongly endorsed the project and urged that at least significant parts of the project be completed in a reasonable period (1-1½ years). Prof. LYKLEMA was asked to communicate this resolution to his collaborators.

7. Presentation of Data in the Primary Literature

Critical Micellization Concentrations. The draft on "Reporting experimental data dealing with critical micellization concentrations (c.m.c's)", prepared by Dr. K. J. MYSELS and Prof. P. MUKERJEE, which had been distributed prior to the meeting was discussed and revised. The draft was then submitted to the Division for approval for publication as Provisional Nomenclature Appendix to *Inf. Bull.* and an information copy was sent to Commission I.1. (The Division, as well as Commission I.1, approved publication.)

Physical Adsorption Data. A guide for the presentation of data on gas adsorption on solids was drafted by Prof. HAUL, and distributed at the meeting. The draft could not be discussed for lack of time. Comments should be made by correspondence by the Members, and would also be solicited from outside experts by Prof. HAUL. Prof. SCHAY agreed to explore the possibility of drafting an analogous proposal for adsorption from the liquid phase.

Other Guides. It was proposed to consider a guide on the presentation of surface film data. Dr. L. TER MINASSIAN-SARAGA had agreed to draft such a guide.

8. Experimental Methodology

The Commission felt that the preparation of guides on experimental procedures would be a worthwhile endeavour in selected areas. Prof. EVERETT had been participating in the preparation of such a guide on surface area measurements by the working party of IUPAC, SCI, and NPL which developed the surface area standards earlier.

9. Education

The Commission celebrated (with appropriate photographs taken) the appearance of the resource book that had been prepared under its auspices. The book was entitled *Physical Chemistry: Enriching Topics from Colloid and Surface Science*. A Resources Book for Students and Teachers of Undergraduate Courses in Physical Chemistry. The book, which was a cooperative effort of 23 authors, was edited by Prof. H. VAN OLPHEEN and Dr. K. J. MYSELS, and published by Theorex, 8327 La Jolla Scenic Drive, La Jolla, Cal. 92037, USA. The soft-cover 400-page book was very modestly priced at US-\$6.50, or substantially lower to members of groups which help publicize the book, in order to get the book in the hands of students. Half of any profits would be turned over to the Commission.

The Secretary recalled that the book had taken a long time in preparation as was usually the case when so many authors were involved. The most serious problem, however, was to find a publisher willing to produce the book at a reasonable price, and if Dr. MYSELS had not have produced the book through Theorex at his own risk, it might never have materialized. Moreover, Dr. MYSELS had put in a very considerable amount of time during the past year in producing the book, for which he deserved the appreciation from the Commission. Members of the Division had expressed their admiration for the excellence of the printing, and felt that it should set an example for IUPAC that high-quality publications can be prepared at a reasonable cost. They recommended that IUPAC would play an active role in promoting the book to help make it a success. Members of the Commission were urged to publicize the book in their respective countries, for example in having it reviewed in the national chemical society journals.

10. Liaison

Liaison with the Commission de Terminologie of the Comité International des Dérivés Tensio-Actifs (CID) has been discussed under item 3. CID, which was an Associate Organization of IUPAC usually requested IUPAC sponsorship for its international conferences, and the Commission had always been requested to make a recommendation on acceptance or rejection of such requests. Based on its experience with previous CID Congresses, the Commission had serious reservations about the scientific standing of these Congresses and hence about IUPAC sponsorship. Therefore, in anticipation of another request for IUPAC sponsorship for the 1976 CID Congress in Moscow, the Commission moved to recommend against such sponsorship unless the organizers would present evidence that the scientific level of the Congress would be up to the standards of IUPAC.

11. Future Directions of the Commission

In addition to pursuing ongoing projects related to colloid and surface chemistry in the classical sense, the Commission intended to devote a considerable part of its future efforts in the area of what might be called chemical physics of surfaces (see under item 3). Therefore, the composition of the membership of the Commission had been changed with this new direction in mind, as follows in the next item.

12. Membership

The following Titular Members had completed 8 years of service on the Commission, and hence were ineligible for continuation as Titular Members: Prof. S. BRUNAUER, Prof. H. VAN OLPHEN, Prof. G. SCHAY, Prof. C. KEMBALL, whose first term of 4 years had expired, was re-elected for another 4-year term. Elected as new Titular Members were: Prof. J. LYKLEMA, Prof. R. S. HANSEN, and Prof. M. W. ROBERTS. Prof. R. HAUL was elected Vice-chairman and Prof. LYKLEMA Secretary.

Associate Members were elected for periods of 2 years, hence the terms of office of all Associate Members had expired. Prof. R. M. BARRER was re-elected to serve another term of 2 years, 1975–77, and the following persons were elected as Associate Members for the same period: Prof. G. ERTL, Prof. J. HABER, Prof. P. MUKERJEE, Dr. H. VAN OLPHEN, Dr. L. TERMINASSIAN-SARAGA, Dr. I. I. TRETIAKOV and Prof. E. WOLFRAM.

The Commission authorized the Chairman to invite the National Committee for IUPAC of the German Democratic Republic to reappoint Prof. W. SCHIRMER as its National Representative to the Commission.

The Chairman proposed a vote of thanks to the Members leaving the Commission for their valuable and dedicated services to the Commission, and expressed his appreciation to the Secretary for his handling of this office for the past 8 years.

13. Funds for Working Party

The Chairman reported that he was asking the Physical Chemistry Division to earmark US-\$2000 of its budget for the coming 2-year period for the support of the 'Working Party on Terminology of Chemical Physics of Solid Surfaces'.

INORGANIC CHEMISTRY DIVISION COMMITTEE

2, 3 and 7 September 1975

Present: Prof. V. GUTMANN (President), Prof. L. MALATESTA (Vice-President), Prof. A. A. VLČEK (Secretary), Prof. C. B. ALCOCK, Prof. K. W. BAGNALL, Prof. R. COLLONGUES, Prof. W. C. FERNELIUS, Prof. E. FLUCK, Prof. N. N. GREENWOOD, Prof. K. YAMASAKI.

1. The question was raised as regards financial support by IUPAC to Titular Members, especially problems which arose in connection with travel arrangements. The latter problem had strongly affected Prof. SWINARSKI.

2. Prof. GUTMANN outlined the activities of the Inorganic Chemistry Division and of its Commissions, prepared on the basis of reports of the Chairmen which were presented to the President well in advance of the meeting. The Division Committee discussed and approved the report of the Division President to Council and reports of Chairmen of the Commissions.

3. The Division Committee discussed and approved the agenda for Meetings of Commissions II.1 and II.3.

(i) *Commission II.1* (Prof. GREENWOOD): An open Meeting was to be held on the definition of Atomic Weight during the Madrid Meeting.

Activities of the International Mass Spectrometry Evaluation Group were discussed and report on the meeting of this group in Washington was given. The goals of this group were regarded as of great importance and the Commission would discuss the recognition of this group as a Subcommittee of II.1. Financial problems for the support of this group were discussed in detail.

(ii) *Commission II.3* (Prof. ALCOCK): Importance of standard material, 'data collection' and definition of 'Terms of Reference' for Commission II.3 were mainly discussed.

4. Commission on Nomenclature of Inorganic Chemistry (Prof. FERNELIUS) had met at Santiago de Compostela on 27 August to 2 September 1974. The Chairman of the Commission gave a short outline of the results of the meeting and concentrated mainly on the general policy of the work of the Commission. Importance of joint interest in resolving problems of inorganic, organic and biochemical nomenclature was stressed. Establishment of bodies of experts for special groups of compounds was considered to be necessary in the near future.

The question of disseminating the information on work, results and approved recommendations was discussed again. It was felt that more activity was needed especially through the National Adhering Organizations.

Commission discussed the problem of names for elements 104 and 105 and came to the conclusion that this problem was not a part of assignment of Commission II.2. General policy in naming of undiscovered elements was also discussed.

5. *Sponsorship*. Sponsorships for the following Conferences were granted by the Committee:

- (i) XVII ICCG — Hamburg 1976.
- (ii) XVIII ICCG — Brazil 1977.
- (iii) IInd Europhysical Topical Conference on Lattice Defects in Ionic Crystals — West Berlin 1976.
- (iv) International Conference on Applications of the Mössbauer Effect — Japan 1978.

Prof. GUTMANN presented information on the conditions for IUPAC Sponsorship which had been agreed during the Meeting of Bureau in Brussels.

6. Letter by Prof. AMIEL, Chairman of the *ad hoc* Committee on Radiochemistry, was carefully and extensively discussed. Division Committee concluded that the letter and activities outlined could not be regarded as sufficient for creating a new IUPAC Commission. Prof. BAGNALL was asked to prepare a new outline of possible activities of the Commission on Radiochemistry, consult it with Division President and present it at the next Committee meeting on 7 September.

7. Information on the preparation of the election of new Division Committee Members by Division Membership was given. Prof. GUTMANN announced his decision to retire at the end of the Madrid Meeting from the post of the President of the Division. He declared his willingness to serve on the Committee for the next term as Past-President.

8. The President gave information on new IUPAC Statutes prepared for discussion at Council meeting.

9. Information on Joint Open Meeting of Inorganic Division, Commission I.1, II.1 and Committee on the Teaching of Chemistry was given.

Open Meeting of Inorganic Chemistry Division, 3 September 1975

Present: 19 Members of Division Committee and Commissions. Prof. V.

GUTMANN in the Chair.

Prof. GUTMANN opened the Meeting by explaining the procedure for the election of new members of the Division Committee according to the By-laws of IUPAC.

Nominations received from Members of Division or National Adhering Organizations were:

Prof. ALCOCK	Prof. GREENWOOD
Prof. EMONS	Prof. JENSEN
Prof. FITZER	Prof. YATZIMIRSKII
Prof. GALLAIS	

From these candidates four were to be elected. After agreement had been reached as to the procedure, the election was carried out by secret vote.

Prof. ALCOCK, Prof. GALLAIS, Prof. GREENWOOD and Prof. YATZIMIRSKII received great majority of votes and were thus elected as new Members of the Division Committee.

. *Division Committee Meeting, 7 September 1975*

Present: Prof. R. COLLONGUES attended the meeting in addition to all those present on 2 September 1975.

1. The Division Committee discussed and approved the final reports of Commissions II.1 and II.3.

Commission II.1. Report of the Commission Meeting is given separately in the pages that follow. The proposal to form a 'Subcommittee on the Assessment of Isotopic Composition' was approved. The Division Committee would seek the funds necessary to cover the activities of this Subcommittee as well as of the Commission in 1976. Report of the Open Meeting held on 3 September 1976, was discussed and approved.

The necessity of labelling of industrial products with potentially varying isotopic composition by manufactures was regarded as of great importance.

Commission II.3. Report of the Commission Meeting is given separately in the pages that follow. The general policy of the work of the Commission was discussed. The President acknowledged the tremendous work of the Commission. He urged, however, the necessity of release of critically evaluated data by the Commission. The line of operation of Commission II.3 encouraged systematic experimental work in the field.

The Division Committee approved the elections to the Commissions II.1 and II.3. There was to be no change in membership of Commission II.3.

2. Prof. FERNELIUS, Chairman of Commission II.2, presented more information on the meeting held in Santiago and stressed points of importance which were agreed by Division Committee. A meeting of Commission II.2 was felt to be necessary in 1976 to achieve a greater progress in finalizing the nomenclature rules. The Division Committee approved both reports from Commission II.2, approved the elections to II.2, and Prof. CHATT as the new Chairman of II.2. It was noted that Prof. SAITO had been nominated as the National Representative of Japan on II.2.

Subcommission II.2.1 was expected to become active after the revision of the organic nomenclature had been published. It had been recommended, and approved, to prolong the membership of II.2.1 for the next 4 years.

3. The recommendation from the Division Committee to the Bureau were the following:

- (i) To approve a press release about the changes in atomic weight values as follows:

Fluorine	from	18.99840	to	18.998403
Silicon	from	28.086*	to	28.0855*
Potassium	from	39.098*	to	39.0983*
Molybdenum	from	95.94*	to	95.94
Cadmium	from	112.40	to	112.41
Barium	from	137.34*	to	137.33

These figures were considered reliable to ± 1 in the last digit or ± 3 when followed by an asterisk.

These changes together with important new annotations and listings would form the Commission's full Report to be published in the Journal *Pure and Applied Chemistry*. The Report will also contain the full Table of Atomic Weights 1975.

- (ii) To approve the rules on naming undiscovered elements as prepared by the Commission.
- (iii) Continuation of the *ad hoc* Committee on Radiochemistry and increasing its membership to 6 with Prof. BAGNALL as a new Member. To accept the essential points of the document and recommendations of Prof. BAGNALL as the starting-point for the further preparation of the Commission on Radiochemistry.

4. The document presented by Prof. BAGNALL on the aims of the Commission on Radiochemistry was discussed. Prof. GREENWOOD emphasized that this document was the first acceptable one. Its essential points were

approved. It was recommended that the Committee [see point 3 (iii)] should prepare a new document by 1976, distribute it among the Members of the Division Committee for finalizing by 1977 at the meeting of the Division Committee. The Committee should establish contacts with Commissions V.7, V.6 and II.2 and relevant outside bodies.

5. The suggestion to include an Inorganic Photochemist in the Commission on Organic Photochemistry was welcomed.

6. Prof. GUTMANN confirmed his wish to retire from the position of the President. Prof. MALATESTA, the Vice-President, expressed his willingness to serve as the President for 2 years, i.e. 1975–77. Prof. GUTMANN asked for suggestions for the election of the new Vice-President. Prof. GREENWOOD was suggested by Prof. MALATESTA and this suggestion was agreed by all Members of Division Committee present.

7. The Meeting was concluded by Prof. GUTMANN who expressed his thanks to all whose term of service on the Division Committee had expired.

COMMISSION ON ATOMIC WEIGHTS (II.1)

3–6 September 1975

Present: Prof. N. N. GREENWOOD (Chairman), Mr. H. S. PEISER (Secretary), Dr. P. DE BIÈVRE, Prof. S. FUJIWARA, Dr. N. E. HOLDEN, Prof. W. H. JOHNSON, Dr. W. W. MEINKE, Prof. E. ROTH (Titular Members); Prof. R. L. MARTIN, Prof. N. SAITO, Prof. A. H. WAPSTRA (Associate Members).

1. The minutes of the previous meeting (Munich, 22–25 August 1973) had been published in *Comptes Rendus XXVII Conference – Part B*, pages 145–147.

2. The Commission had held six half-day sessions in Madrid, including an Open Meeting to which all members of the Inorganic Chemistry Division had been invited together with the members of several cognate Commissions.

3. The principal task of the Commission concerned the collection and assessment of the latest critically evaluated data on atomic weights. As in previous years a *News Release* was prepared to allow rapid and widespread dissemination of the recommended changes in atomic weights values. The most important changes were as follows:

Fluorine	from	18.99840	to	18.998403
Silicon	from	28.086*	to	28.0855*
Potassium	from	39.098*	to	39.0983*
Molybdenum	from	95.94*	to	95.94
Cadmium	from	112.40	to	112.41
Barium	from	137.34*	to	137.33

These figures are considered reliable to ± 1 in the last digit or ± 3 when followed by an asterisk. A full discussion of these and other changes in the format of the Atomic Weights Table would appear in the Commission's full *Report* in *Pure and Applied Chemistry* but a brief indication of the reasons for the changes is given in the following paragraphs.

Fluorine was mononuclidic and was most unlikely to have undiscovered stable isotopes. The addition of one further significant figure to the quoted atomic weight value made this the most precise value for any element in the Table. Although this increased precision was unlikely to be needed by chemists the Commission believed its task was to provide the best available atomic weight data since potential usefulness could not be predicted.

Silicon also had a ten-fold refinement in atomic weight value. This arose from recent work at the National Bureau of Standards in Washington and was of

unusual significance as it was associated with a redetermination of Avogadro's Constant to unprecedented accuracy in the parts per million range.

Potassium likewise had a ten-fold increase in precision following work of the NBS, which further established that the natural terrestrial variability was not larger than the present experimental uncertainty of measurement.

Molybdenum and *Barium* had changes that represent a three-fold improvement in precision; they were based on a careful analysis of recent data in conjunction with earlier determinations by several techniques. The adjustment of the value for *cadmium* was within the previously stated uncertainty but was recommended because new evidence strongly favoured the new value.

4. An important extension of the work of the Commission had resulted from the formation of its Subcommittee on the Assessment of Isotopic Composition of the Elements. Interim recommendations based on mass spectrometric evidence would be included in the Commission's definitive Report and the Subcommittee's next task would be to harmonize these interim values with other data to obtain a set of isotopic compositions that was fully consistent with the Table of Atomic Weights. This extensive new tabulation of critically assessed data would be of considerable value to both academic chemists and those working in the chemical industry.

5. The Commission had drawn attention to the lack of precision in the definition of 'atomic weight (relative atomic mass)' which was causing problems in presenting a definitive table of atomic weights. This and related matters had been discussed at an Open Meeting and a broad consensus emerged. The Commission was asked to develop a draft version of a refined definition and associated guidelines for the preparation of the Table of Atomic Weights.

6. The Commission had discussed many other topics which would be fully treated in its Report in *Pure and Applied Chemistry*. In particular, it recommended that wide publicity be given to its proposals on the voluntary informative labelling by manufacturers of well-characterized chemicals in order to disclose to users any anomalies in isotopic abundances. It was hoped that the suggestions made by the Commission would one day develop into a code of good practice which might possibly be of wider applicability.

7. Prof. GREENWOOD had retired at the end of Madrid Conference from Titular Membership of the Commission, after serving for 6 years as its Chairman. The new elected Chairman was Prof. E. ROTH who had been a Member of the Commission for several years. The new secretary, Dr. N. HOLDEN,

replaced Mr. H. S. PEISER who had retired at the end of Madrid Conference after a period of outstanding service on the Commission.

COMMISSION ON HIGH TEMPERATURES AND REFRACTORY MATERIALS (II.3)

3–6 September 1975

Present: Prof. C. B. ALCOCK (Chairman), Prof. G. D. RIECK (Secretary), Prof. G. DE MARIA, Prof. E. FITZER, Prof. M. FOEX, Prof. J. HLÁVÁČ, Dr. B. C. H. STEELE (Titular Members); Prof. F. CABANNES, Prof. P. W. GILLES, Dr. W. S. HORTON, Dr. R. W. OHSE (Associate Members); Prof. R. COLLONGUES, Prof. R. SERSALE (National Representatives).

1. Minutes of Previous Meeting

The minutes of the meeting in Prague on 17–18 October 1974 with the addition of 29 May 1975 [see *Inf. Bull.* Nos. 50/51 (November 1975), pages 103–106] were approved.

2. Reports of Activities

(i) *High-temperature Bibliography.* According to a report submitted by the editor, Dr. M. G. HOCKING, the financial status of the Bibliography was satisfactory. In view of the general increase of costs, however, it was agreed to allow him to raise the price by £0.60. It was planned during the next year to make some reimbursement of loans which had been made to support the publication, beginning with that from IUPAC. The quality of the publication was considered to be quite satisfactory, but there existed a shortage of contributors. This would be rectified through action by the Commission's national representative for his national journals. Discussions would be opened with the editor of the *Index Thermochimique* to resolve problems of overlap in content. It was agreed that although there should be collaboration, no change in our style and content was envisaged.

(ii) *Melting Points.* Prof. FOEX presented a report on the work of the Task force on the melting point of Y_2O_3 . Prof. CABANNES added some verbal information concerning his recent results on this subject which were substantially in agreement with those of the Task force. The melting point had now been established in vacuum and air and within the present limits of experimental error ($\pm 15^\circ C$) it is $2436^\circ C$. It therefore emerged that Y_2O_3 appeared more satisfactory than Al_2O_3 with respect to environmental stability. This appearance might result from the fact that the error was larger at the higher temperature at which Y_2O_3 melts.

The Task force had therefore been split in two groups, one of which will

be the Task force ' Y_2O_3 as a melting point reference material' and the other under the general title 'Melting points' would be held in abeyance for 1 year. It was intended to publish the results of the Foex report in the *Revue des Hautes Températures*. After suitable editing the chairman would write to each of the contributors seeking their permission to publish their work in this form and obtaining clarification of the method of presentation of the results. Members of the Commission would receive a copy of the report for their comments, before submission to the journal.

Following the receipt of some preliminary information from Prof. NOWOTNY, Prof. FITZER and Dr. HORTON would pursue the matter of melting and eutectic points in metal-carbon systems by contacting Drs. RUDY, BOWMAN (USA) and Prof. SHEINDLIN (USSR).

(iii) *Vapour Pressures*. Prof. GILLES had reviewed the IUPAC sponsored publication on the vapour pressures of Cd, Ag and Au. Because of the dispersions in these results, a reconsideration might be called for from the contributing authors. This would include considerations of temperature measurements and of the existence of temperature gradients at critical parts of the apparatus. Members of the NBS staff who had been involved in preparing the publication would be asked to supply more information and if possible to carry out further statistical calculations. Four members of the Commission would act as a committee to consider the evaluation of standard procedures for vapour pressure measurements in the light of this earlier study and subsequent developments which were reported in the literature (DE MARIA, GILLES, HORTON and DROWART).

Dr. HORTON would try to get information concerning the uses which were made of the samples of the standard materials which had been purchased.

(iv) *Optical Pyrometry*. In Prof. MOTZFELD's absence Dr. HORTON reported that the ASTM was currently preparing a new edition of their recommendations on this subject. As it was anticipated that a first draft would be available to him within the next year, it was decided to suspend any action by the Commission until these recommendations had been considered. This view had been confirmed by Prof. MOTZFELD in a letter addressed to the Commission.

(v) *High-temperature X-ray Diffraction*. As a result of the discussions at this meeting, it has been decided to rename this Task force 'Internal Standards for Temperature measurements in High-temperature X-ray diffraction'. This change had been brought about as a result of the considerable advances in precise knowledge of the lattice parameter of Al_2O_3 as a result

of neutron diffraction studies. These measurements, which were carried out at the Institut Laue-Langevin at Grenoble (France), provided the most accurate information to within 50°C of the melting point of Al_2O_3 . The new results could now be used as internal standards in high-temperature X-ray diffraction up to 2000°C . Other laboratories such as Harwell and Los Alamos would be asked to take part in collaborative studies of neutron diffraction at high temperatures to repeat this work. It was hoped in the future to make similar studies at higher temperatures with Y_2O_3 . It was suggested that work should be done on graphite with neutrons to provide results which could be compared with the well-established X-ray data on graphite and Pt. It was thought that the temperature homogeneity in these substances was better than in the case of Al_2O_3 in the X-ray measurements.

(vi) *Solid Electrolytes and Reference Electrodes*. Under this new title Dr. STEELE reported on possibilities of mounting a collaborative study of the properties of solid electrolytes and reference electrodes for use at high temperatures. He had obtained offers of stabilized zirconia tubes of uniform characteristics from Zirconium Corp. of America and Czech Atomic Energy Commission. The chairman had explained to representatives of Zircoa the nature of the IUPAC sponsored collaborative study and the requirements with respect to freedom of publication. Prof. HLAVÁČ would carry out similar discussions in Czechoslovakia. With samples of both origins, several laboratories would be asked to carry out measurements of the electron transport number as a function of oxygen potential and temperature, by their own method. This would provide a comparison of the three methods normally employed. The status of this survey had now been changed to a collaborative study.

Dr. OHSE would contact Degussa to see if they were interested in providing a third source of tubes for the same purpose.

During this coming year Dr. STEELE would discuss the choice of systems for reference electrode studies which will be carried out at the next stage.

(viii) *Non-stoichiometry*. Dr. OHSE reported on a preliminary survey of the contents which would be required for a monograph on all properties of non-stoichiometric oxides. It was decided to defer action on the project for the next year. It had been pointed out that there were two important aspects on this problem: the analytical one and the defect-structural one.

On the first of these aspects the chairman would contact the Analytical Chemistry Division. From the second aspect it was decided that a good start could be made on the Magneli phases Ti_3O_5 up to Ti_9O_{17} . No Task force

would be created for the present but a Committee would undertake a collaborative study of these systems during the coming year (ALCOCK, DE MARIA, STEELE, DROWART and GILLES).

(viii) *Carbon, and Refractory Carbides*. Prof. FITZER reported on the activities in a number of national groups on the characterization of carbon. The collaboration had already been established amongst the European groups, and the American group had now agreed to join them (Pittsburgh Conference, 1975). Dr. HORTON was the American representative. The Japanese carbon group, it was hoped, would join this collaborative study in the near future.

After discussion it was decided to extend the work of the Commission into the field of refractory carbides especially SiC. An important aspect would be the techniques of characterization of these materials. Here again there were analytical and structural aspects. On the first aspect it was suggested that a joint Task force could be formed with the Analytical Division (ALCOCK). Prof. SERSALE would conduct a preliminary survey on the structural aspects of this problem as concerned SiC and Si_3N_4 during the coming year. He presented already at this meeting a report indicating that there was need for international standardization for these and other ceramic materials.

(ix) *Hot Corrosion and Solid Gas Kinetics*. The Chairman agreed to ask Prof. AMATO to undertake a preliminary survey on the feasibility of a standard procedure for testing the corrosion of Ni-Cr-alloys by hot combustion gases. This area had been chosen because of the considerable interest in gas-turbines and heat exchangers.

In the absence of Prof. MROWEC it was decided to defer action on the kinetics of solid-gas reactions for another year.

3. Terms of Reference

Dr. HORTON presented to the Commission a suggested content for Terms of Reference. After some discussion a modified version of these was accepted.

4. Definitions of Activities

In order to clarify the terms which had been used throughout the minutes and reports of the Commission, the terms: 'Task force', 'Collaborative Study Group', 'Preliminary Survey Team' and 'Committee' were defined.

5. Other Matters

- (i) It was decided that after consultation with the IUPAC Bureau efforts

should be made to publish representative reports and papers of the Commission's work in the international high-temperature journals. The chairman and the secretary would prepare a paper on the structure and the work of the Commission, to be published in *High Temperatures – High Pressures*.

- (ii) The Commission expressed concern about the fate of the IUPAC recommendation on Thermometry. The chairman would inquire about this matter.
- (iii) The Commission considered what action it should take in connection with the proposed publication *International Data Series*. Whilst expressing general support for such a project, it was decided to refer the matter to Prof. KUBASCHEWSKI. He would be asked to make a preliminary survey of further relations with this publication and suggest some names for potential members of an international editorial board.
- (iv) Dr. OHSE suggested that a future activity of the Commission could be to assess and select data on critical phenomena of refractory materials. He would make a preliminary survey.

6. Membership

Prof. CABANNES announced his retirement from the Commission as an Associate Member. Nominations were received for a successor, but no formal vote was taken at the meeting.

7. Future Meetings

In view of the many tasks which were in hand it was decided that a meeting would be necessary next year. A tentative date and venue had been decided for late September in Rome.

There was a possibility that a meeting would be organized in Odeillo in 1977, devoted to high-temperature topics.

ORGANIC CHEMISTRY DIVISION COMMITTEE

3 and 6 September 1975

Present: Prof. A. KJAER (President), Prof. G. OURISSON (Past-President), Prof. H. ZOLLINGER (Vice-President), Prof. P. YATES (Secretary), Prof. V. C. BOEKELHEIDE, Prof. I. ITÔ, Prof. J. TOMKO (Members); Prof. J. MATHIEU (Coopted Member). In addition, the following Commission and Section Officers were present during discussion of business relating to their Commissions and Section: Prof. N. LOZAC'H (III.1; Chairman), Prof. O. HOFFMANN-OSTENHOF (IUPAC-IUB Commission on Biochemical Nomenclature; Chairman), Prof. O. L. CHAPMAN (III.3; Chairman), Prof. K. SCHAFFNER (III.3; Secretary), Prof. E. J. ARIËNS (III.4; Chairman), Dr. A. I. RACHLIN (III.4; Secretary).

1. Minutes of Previous Meeting

The minutes of the meeting in Munich, 25–27 August 1973 (see *Comptes Rendus XXVII Conference – Part B*, pages 158–160) were approved.

2. Report of Division President to Council

The President presented his report (included elsewhere in this publication). He also drew the attention of the Committee to two IUPAC organizational matters that were of importance to the Division: (i) under the proposed new Statutes and By-laws, the maximum period of continuous service on the Division Committee would be 10 years; thus in future it would not be possible for the Past-President to remain on the Committee after serving for 4 years as a Member and 2 years each as Secretary, Vice-President, and President; (ii) a proposal to include the Medicinal Chemistry Section (III.4) in a new Health and Environmental Chemistry Division was under consideration, and could have far-reaching consequences for this Section.

The Committee considered that it was unfortunate that under the proposed new Statutes and By-laws the expertise of Past-Presidents would be denied to the Division Committee. The President undertook to raise the matter at the forthcoming meeting of Division Presidents with a view to amendment of the proposal. (It was subsequently unanimously recommended at this meeting that exceptions from this proposal be made in cases where persons retiring after 10 years of service occupied the Presidency, and that such persons be permitted to serve for 2 additional years as Past-President.)

3. Reports of Commission III.1 and CBN

Prof. LOZACH presented the report of Commission III.1. Prof. HOFFMANN-OSTENHOF subsequently amplified the section of the report relating to the IUPAC-IUB Commission on Biochemical Nomenclature.

The Committee was in accord with the eventual abolition of the joint IUPAC-IUB Commission provided that cross representation was maintained on the individual Commissions. It was considered important that Commission III.1 establish a Subcommission on the Nomenclature of Natural Products.

The Committee approved the recommendation of the renewal of the present membership of Commission III.1 for a period of 2 years, provided that the number of Associate Members was increased and that it was recognized that there was need for change of the Titular Membership after this period.

The Committee approved the recommendation of the renewal of the Membership of Dr. COHN and Profs. KARLSON, KLYNE and WEBB on the joint IUPAC-IUB Commission for a period of 2 years and the appointment to Membership of Dr. H. B. F. DIXON for a period of 2 years.

4. Report of Commission III.2

Prof. ZOLLINGER reported that work was proceeding on the naming of reactions and that proposals for the nomenclature of organic reactions would be formulated at a meeting of the Commission in Montpellier in September 1976. At that time a decision would be made regarding further work on the nomenclature of mechanisms; discussions to date have indicated that it might not be possible to develop a universal nomenclature of mechanisms. A projected area of study by the Commission was the standardization of physical symbols; this study would be aided by the continuing service of Prof. COLE of the Physical Chemistry Division as an Associate Member of the Commission. However, it might be decided that this was a task for the Physical Chemistry Division, aided by submissions from the Commission. It was possible that the Commission's work would be completed and that it could be dissolved after 2 years. No change in the present membership of the Commission was contemplated, and the Committee approved the recommendation of the renewal of the Associate Membership of Prof. COLE for a period of 2 years.

5. Report of Commission III.3

Prof. CHAPMAN presented the report of Commission III.3 which is published

in the pages that follow. The Committee approved the recommendation of the renewal of Titular Membership of Profs. CHAPMAN and SCHAFFNER for a period of 4 years and the appointment of Profs. KOERNER VON GUSTORF and ADAM WELLER as Titular Members and of Dr. D. W. TURNER as an Associate Member for a period of 4 years.

6. Report of Section III.4

Prof. ARIËNS reported that the plan of the Section to build up a communication system among medicinal chemists had now reached fruition. The Section would participate in the International Symposia on Medicinal Chemistry in Paris on 19–22 July 1976, and in London in 1978; the latter symposium would be concerned with both the scientific and educational aspects of medicinal chemistry. A Committee was being set up within the Section to consider the standardization of chemical and biochemical parameters used for determining structure-activity relationships; discussions would be initiated with IUPHAR regarding biological parameters. The Section was actively engaged in promoting systems of data flagging in journals.

Prof. ARIËNS then proceeded to discuss the future of the Medicinal Chemistry Section in the light of recent decisions and proposals of the administrative organs of IUPAC (cf. item 2). He expressed the view that the terms of the proposed New Statutes and By-laws degraded the Section to a Commission. He pointed out that this entailed the necessity for justification of continuing existence every 2 years, while the achievements of the Section had already established the need for its permanent existence. Therefore, Prof. ARIËNS had already dispatched to the Division President a letter outlining the Section's preferences in regard to its future status. In brief these were as follows, in order of preference: (i) independent Section reporting directly to the Bureau, (ii) Section or Commission attached to the Division of Applied Chemistry, (iii) *status quo*. There followed a frank and vigorous discussion in which the Division Committee indicated that it would not object to a departure of the Medicinal Chemistry Section from the Division, although it considered it most appropriate and desirable for the Section to remain affiliated with the Division. Prof. ARIËNS emphasized the desirability of the Section's having a direct voice in the Bureau. However, the Committee did not consider it realistic to expect that independent status would be granted to the Section. The President reported that at a meeting of Division Presidents it had been agreed unanimously that no

precipitate action in regard to reorganization should be taken at the Council meetings at the present Conference, but that a working group should be established to consider this. Prof. ARIËNS agreed that Section III.4 should send a representative to such a group and that the Section would be willing to continue in affiliation with the Organic Chemistry Division for the next 2 years. He pointed out, however, that if the medicinal chemists were unable to obtain an acceptable status within IUPAC, there was the undoubted possibility of their association with bodies other than IUPAC.

The Committee approved the recommendation of the renewal of the Titular Membership of Section III.4 of Prof. PROTIVA and of the Associate Membership of Dr. NITYA ANAND for terms of 4 years, and the appointment of Dr. CAVALLA and Profs. MUTSCHLER and SAREL as Titular Members and of Drs. HOULIHAN, KOBAYASHI and TOLDY and Profs. DAHLBOM, MARINI-BETTOLO, MATHIEU, and NAUTA as Associate Members for terms of 4 years.

7. Sponsorship and Organization of Symposia

(i) *Natural Products*. The 10th Symposium would be held in 1976 in Dunedin, New Zealand. It was agreed to accept an invitation from the Bulgarian Academy of Sciences to hold the 11th Symposium in September 1978, in Varna, Bulgaria, provided that the following conditions could be met: (a) completion of the official questionnaire including satisfactory publication agreement, submission of a list of invited speakers for approval (none of whom should have been plenary lecturers at the Ottawa and Dunedin Symposia), and assurance of admission to Symposium of all *bona fide* chemists, (b) freedom of participants to make independent travel arrangements for travel to the Symposium, and (c) there should be no overlap with other symposia in related fields. If these conditions could not be met, it was agreed that the acceptance of an invitation from the Hungarian Academy of Sciences to hold the 1978 Symposium in Budapest should next be explored.

A proposal was made that the 12th Symposium might be held in 1980 in the Canary Islands, organized by Prof. GONZALES.

(ii) *Physical Organic*. The 3rd Conference on Physical Organic Chemistry would be held in 1976 in Montpellier (France) and the 4th Conference in 1978 in York (UK).

(iii) *Synthesis*. The Sociedad Química de Mexico had offered the possibility of having the Symposium towards the end of 1976, but no firm commitment

had been made. The likelihood of finding somebody in the U.S. who was willing to organize the Symposium appeared to be remote. The Committee agreed that the Vice-President should explore the possibility of holding it in Switzerland in 1977. Failing these possibilities, it was agreed that an approach should be made to Prof. SAREL to determine whether it would be possible to transform a proposed Symposium on Heterocycles as Intermediates in Organic Chemistry in Jerusalem in 1977 or 1978 into a Symposium on Organic Synthesis with emphasis on Heterocyclic Chemistry. (iv) *Other Symposia*. Sponsorship of the following Symposia had been approved.

VIII Carbohydrate Chemistry, Kyoto (Japan), 1976.

Low Molecular Weight Sulfur-containing Natural Products, Jablonna-Warsaw (Poland), 1976.

VI Organic Photochemistry, Aix-en-Provence (France), 1976.

8. Budget

The Committee agreed to leave the assembly of the budget to the President and Secretary, after they had received submissions from the Commissions and Section. The President emphasized that it was unlikely that the full amount requested in the budget would be granted and that it would probably be necessary to cut back on the amounts requested by the Commissions and Section.

In subsequent discussions (*vide infra*) it was pointed out that additional funds would be necessary if the Division took the initiative in organizing symposia in new fields of current interest and importance.

9. Election of New Members and Officers

Two nominations for Membership had been received prior to the meeting: Profs. BELETZKAJA and CROMBIE.

After lengthy discussion and consultation with the Chairmen of the Commissions and Section, the following proposal was agreed upon:

President: Prof. H. ZOLLINGER.

Past-President: Prof. A. KJAER.

Vice-President: Prof. P. YATES.

Secretary: Prof. I. ITÔ.

Titular Members (1973–77): Profs. V. C. BOEKELHEIDE and J. TOMKO,

New Titular Members (1975–79): Profs. G. MODENA (Padua), H. MUSSO (Karlsruhe), and R. A. RAPHAEL (Cambridge).

Coopted Members: Drs. K. HEUSLER and H. E. SIMMONS and Prof. J. MATHIEU.

New Coopted Members (1975–79): Drs. SUKH DEV (Malti-Chem, Baroda), TANIDA (Shionogi, Osaka), and BROUWER (Shell, Amsterdam).

It was agreed that henceforth election of Coopted Members should be for a term of 4 years and that the number of Coopted Members should not exceed 5. The President-Elect would write to Dr. SIMMONS asking whether he might wish to resign in the light of the newly introduced 4-year term for Coopted Members. If this was not the case, only the first two of the above new nominees for Coopted Membership would be approached initially.

10. Other Business

(i) *Possible Commission on Organometallic Chemistry.* It was agreed that Prof. J. CHATT should be approached regarding the necessity for a new Commission on Organometallic Chemistry and should such a Commission appear to be appropriate, he should be asked to consult with Prof. BELETZKAJA.

(ii) *Institute of Natural Products Chemistry, Sri Lanka.* The Committee agreed to convey through its President its moral support of, and interest in, the projected Institute of Natural Products Chemistry in Sri Lanka, with an expression of interest in learning of further developments. The President of the Division would also seek to arrange for a similar expression of support and interest from the President of IUPAC.

(iii) *Company Associates.* Prof. MATHIEU reported on the deliberations at the Meeting of Company Associates.

(iv) *New Initiatives.* The President of the Division drew to the attention of Members of the Committee the importance of taking new initiatives. In particular he considered it of great importance to initiate the organization of Symposia in new fields of current interest and importance. The Committee agreed with this view and the following areas were suggested: biomimetic organic chemistry, selected fields of organometallic chemistry, and organic conductors and semiconductors. Committee Members were asked to give further consideration to these and other possible initiatives and to transmit their suggestions to the President-Elect.

(v) *Vote for thanks.* The President-Elect expressed on behalf of the Committee their appreciation of the splendid contribution by Prof. KJAER to the Division as President. The President in turn expressed his gratitude to the Committee for its work.

COMMISSION ON ORGANIC PHOTOCHEMISTRY (III.3)

4-5 September 1975

Present: Prof. O. L. CHAPMAN (Chairman), Prof. K. SCHAFFNER (Secretary), Prof. T. MUKAI (Titular Members); Prof. A. M. OSMAN (National Representative, Arab Republic of Egypt).

1. The future of the newly formed American Photochemistry Association (APA) and its relationship to the European Photochemistry Association (EPA) was discussed. Commission III.3 had been useful in developing both the EPA and the APA. It provided the major link between the two Organizations. Prof. K. SCHAFFNER was President of EPA and Prof. CHAPMAN was a Member of the Executive Committee of the APA. The possible formation of a Far East Photochemistry Association was discussed.

2. The frequency of IUPAC Photochemistry Symposia was discussed. It seemed that the best plan would be to have the traditional IUPAC meeting (which is heavily European) meet every 3 years and to have a largely American meeting every 3 years and a largely Far Eastern meeting every 3 years. This would permit a highly desirable coverage of the earth without undue frequency in any region. It might be possible for EPA, APA and FEPA to take over responsibility in the future.

3. Plans for the VIth IUPAC Symposium on Photochemistry to be held in July 1976 in Aix-en-Provence, France, were discussed in detail. Prof. SCHAFFNER was the Chairman of the Organizing Committee.

4. The Symposium on Photochemical Methods in Organic Synthesis held in Belgium that week was reviewed. This symposium grew out of discussions held at the Commission meeting in Munich. Profs. SCHAFFNER and CHAPMAN had served as members of the Scientific Committee for the Symposium.

5. Possible topics for future symposia were discussed. The topics with the greatest support were:

- (i) photochemistry of synthetic and natural macromolecules;
- (ii) photobleaching of dyes;
- (iii) chemistry of photo-induced resin curing (for coatings);
- (iv) photochemistry in chemical education.

6. Tentative plans to hold a symposium on preparative photochemistry in honour of Prof. SCHÖNBERG were formulated. The project would be cleared with Prof. SCHÖNBERG before further action was taken. Egypt was

the most fitting site for the Symposium, and the members of the Egyptian delegation expressed interest in organizing the symposium which would cover synthesis, applications of photochemistry, and solar energy among other topics.

7. Membership consideration, especially those relating to other disciplines, occupied a significant fraction of Commission's time and actions taken in this area are summarized hereunder.

The Commission had a meeting on 4 September with Dr. R. N. JONES, President of the Physical Chemistry Division, and Dr. S. SUNNER at their request. The representatives of the Physical Chemistry Division expressed interest in the creation of a Commission on Physical Photochemistry or adequate representation on the Commission on Organic Photochemistry. They had preferred the latter solution.

An indirect expression of interest in formation of an Inorganic Photochemistry Commission had also been brought to the attention of our Commission.

These matters were discussed in detail at the meeting of the Commission on 5 September. We concluded that three commissions dealing with inorganic, physical, and organic photochemistry would be an unduly expensive luxury for IUPAC. It was also undesirable from a scientific point of view to fragment the field of photochemistry. Two approaches were considered. First, we considered the possibility of appointing Associate Members. If these Associate Members were also members of existing IUPAC Commissions, there would be no additional cost to IUPAC. A diligent search of the membership of Commissions in Inorganic and Physical Chemistry Divisions produced only one suitable name, Dr. D. W. TURNER, an Associate Member of the Commission on Molecular Structure and Spectroscopy. The second approach considered involved expansion of our present commission by one inorganic Titular Member and one physical Titular Member. This approach was favoured by the Commission who recommended the appointment of Prof. KOERNER VON GUSTORF of Mühlheim and Prof. A. WELLER of Göttingen as Titular Members. This expansion would meet the legitimate needs for representation of inorganic and physical photochemists in IUPAC decisions which affect their fields of interest. It would also significantly enhance interactions of Commission III.3 with other divisions. It would be ideal for the new members to be made Associate Members of pertinent commissions in their divisions. In the event that Prof. KOERNER VON GUSTORF could not serve, Prof. M. WRIGHTON (MIT) would be a suitable alternative. Dr. H. GRELLMAN

(Göttingen) would be a suitable alternative if Prof. WELLER could not serve.

8. The discussions of the Commission concerning proper reporting of filter information was continued. The earlier discussions had led to publication of Prof. H. MORRISON's paper giving the absorption spectra of various samples of Pyrex glass which had cutoff points differing by more than 100 nm. The consequences of this in synthesis were enormous. It was noted that Prof. MORRISON's paper had been solicited by the Commission.

Discussion of the proper reporting of photochemical data, especially quantum yields, occupied much of the afternoon of 5 September. It became increasingly clear what the problems were but the solutions were not clear. The necessity of reporting solvent, temperature, wavelength range, optical density, and concentration were obvious to the Commission. It was rare even in good papers (such as those published by Commission Members) to find more than two of the items listed included.

SECTION ON MEDICINAL CHEMISTRY (III.4)

4–5 September 1975

Present: Prof. E. J. ARIËNS (Chairman), Dr. A. I. RACHLIN (Secretary), Prof. A. ALBERT, Prof. E. CAMPAIGNE, Dr. L. G. HUMBER, Dr. M. PROTIVA, Prof. P. SENSI (in part), Dr. J. THUILLIER (Titular Members); Prof. E. MUTSCHLER (Associate Member); Prof. HOFFMANN-OSTENHOF (Representative of IUB); Prof. G. MUÑOZ (Observer).

1. Minutes of Previous Meeting

The minutes of the meeting held in Noordwijkerhout, Netherlands on 8–9 September 1974 [see *Inf. Bull.* No. 49 (March 1975), pages 59–63] were approved.

2. Application for Divisional Status

Indications were that elevation to divisional status, as discussed at the last meeting, would be highly unlikely. In fact, at the time of the 28th Conference, a proposal was being considered which would have changed the status of the Section to that of a Commission. The membership made it clear that our active programme and future plans were totally inconsistent with the temporary nature of a Commission and further, that our viewpoint should be made known to the highest IUPAC governing body before a decision of this magnitude was finalized. The meeting was adjourned temporarily while an *ad hoc* committee comprising Prof. ARIËNS, Dr. RACHLIN, Prof. CAMPAIGNE and Dr. HUMBER drafted a letter (subsequently discussed and approved by Section) to Prof. KJAER for presentation to the Bureau expressing the Section's viewpoint.

3. Old Business

Contacts with Medicinal Chemistry Publications (Prof. Burger). Prof. BURGER had reported by letters to Drs. CAVALLA and RACHLIN that Dr. CROSS of the Chemical Society, London, had not responded to his inquiries (see report of previous meeting). He had, however, received a favourable response from the editor of *J. Pharm. Sci.* relative to possible coordination of their style with that of the *European J. Med. Chem.* and she would await further information from Prof. NAUTA. The editor of *J. Med. Chem.* indicated he would submit the proposals to his Editorial Board and

the Publications Board of ACS in September. Prof. BURGER was commended for his efforts and was requested to report any new developments from these and other contacts.

Further discussion brought out the need to develop guidelines for the content of papers on medicinal chemistry. There was no uniformity, especially in borderline journals which do not specialize in this field, with respect to the presentation of biological and chemical data. It was voted to request Prof. BURGER to draft such guidelines, both biological and chemical, but with particular emphasis on the standardization of pharmacological data. The secretary would ask Prof. BURGER to prepare these guidelines with suggested distribution for approval at the next Section Meeting.

Section Publications (Newsletter, Reports). The *Newsletter* continued to get wide distribution and the practice of widespread duplication and regional distribution had been encouraged. Dr. RACHLIN requested more participation by the general membership along the lines of Prof. ALBERT's column on WHO publications. Other suggestions were the incorporation of a column devoted to abstracts of regional meetings and listing of suggested symposia topics. An effort would be made to implement both suggestions. The IUPAC Secretariat had been asked to supply 249 reprints of the recently published report ' "Predicted" Compounds with "Alleged" Biological Activities from Analyses of Structure-Activity Relationships' in *Information Bulletin* No. 49 (March 1975). It was agreed to distribute copies to the editors of medicinal chemistry journals, a list to be supplied by Dr. HUMBER. Copies would also be distributed to the members of QSAR – coordination Group of EFMC. Our members and correspondents were also urged to distribute the report whole or in part.

Correspondents. No new correspondents had been added since the last meeting despite Section's continuing efforts. Prof. MUÑOZ indicated that an Institute of Medicinal Chemistry was founded in Madrid in 1974 and currently an attempt was being made to organize a group of those interested in this field. He was requested to act as unofficial correspondent for Spain until such an organization came into being. Prof. CAMPAIGNE indicated that he could suggest a possible correspondent from one of the developing African countries.

4. Activities of Committees

European Federation for Medicinal Chemistry (EFMC) Including Quantitative Structure-Activity Relationships (QSAR) (Dr. THUILLIER). Dr. THUILLIER

reported on the last meeting of EFMC which had been held at Chatenay-Malabry, France, on 10 April 1975 mentioning those items of interest to our Section such as future jointly sponsored symposia, the *European Journal of Medicinal Chemistry* and in particular the affiliation with EFMC of the recently formed (February 1975) Coordination Group of QSAR of EFMC. Regarding the possible involvement of our Section in QSAR, a Working Party consisting of Drs. HUMBER and THUILLIER was appointed to represent the Section at the forthcoming annual meeting of Soc. Chim. Ther. (Montpellier, France: 10–13 September 1975). Drs. HUMBER and THUILLIER would advise QSAR-EFMC group to widen its scope by contacting a group such as the Society for Quantum Biology. If they were willing to do so, our Section would act as the mondial coordinating body by setting up a Working Committee for this purpose. Suggested membership in this Committee would include two from the Section (Dr. HUMBER and one to be selected), two from QSAR-EFMC (Dr. REKKER and Prof. GODFROID, for example) and two from the US Group. Dr. HUMBER would report back after the Montpellier meeting so appropriate action could be taken.

Long-range Planning Committee (Dr. Cavalla). Dr. CAVALLA sent a committee report which was read, discussed and accepted. The report covered six points which were offered as areas of continuing interest for the Section. The items covered were: (i) importance of insuring permanence of the Section; (ii) effect of government controls on the evaluation and introduction of new drugs; (iii) ways and means of promoting more research on tropical diseases; (iv) question of drug quality and bioavailability; (v) appropriate topics for symposia; (vi) teaching of medicinal chemistry. Following is the disposition of each point: (i) covered by the letter addressed to Prof. KJAER (see item 2). (ii) and (iv) judged to cover areas which could not be handled effectively by our Section. (iii) fell within our purview and was consistent with IUPAC's desire to aid developing countries through chemistry. There was some question as to the present status of specific aspects of the problem. Clarification would be sought by having the Secretary contact the editor of the *WHO Chronicle* for information concerning the extent and scope of existing testing facilities and any other pertinent details which could guide future Section activity in this area. (v) Promotion of symposia was an important continuing Section function. A specific proposal for consideration by the committee organizing the 1978 meeting in UK was an interdisciplinary symposium covering agents for human application or ingestion such as flavouring and/or olfactory agents, pheromones allied to the question of

population control, food additives and colours, etc. Other topics would be solicited and publicized in the *Newsletter*. (vi) Teaching of medicinal chemistry should be a continuing agenda item.

The committee was continued as presently constituted except that retiring Section members would continue as advisors, i.e. Dr. CAVALLA (Chairman), Prof. MUTSCHLER (Secretary), Prof. SAREL, Advisors: Prof. ALBERT, Prof. ARIËNS, Prof. BURGER, Prof. CAMPAIGNE, Prof. SENSI.

Committee on Education (Prof. Nauta). A short report was received from Prof. NAUTA to the effect that Dr. CAVALLA had already taken steps to set up a short course on teaching of medicinal chemistry in 1978 as a continuing part of the VIth Symposium. Prof. NAUTA would contact Dr. CAVALLA about approaching European delegates and correspondents for their comments on *Technical Report* No. 13.

The committee was to continue as presently constituted: Prof. NAUTA (Chairman), Dr. CAVALLA (Secretary), Prof. COMBET-FARNOUX and Prof. MUTSCHLER. Advisors: Prof. ALBERT, Prof. BURGER, Prof. PRATESI.

5. Symposia and Meetings

25th IUPAC Congress, Jerusalem: July 1975 (Prof. Sarel). Prof. SAREL submitted a report which indicated that the Congress was attended by 950 participants from 25 countries. The part of the Congress devoted to medicinal chemistry covered 7 major topics involving 9 main lectures and 32 short (20 minutes) lectures. Seven main Congress lectures would be published in 1976 in the Journal *Pure and Applied Chemistry* (provisionally Vol. 47, No. 1). A report on the Congress is scheduled for publication in *Inf. Bull.* No. 52.

Vth International Symposium on Medicinal Chemistry, Paris: 19–22 July 1976 (Dr. Thuillier). Dr. THUILLIER reported that plans for this symposium were in an advanced stage. It would comprise only invited lectures and poster presentations. The first announcement had been mailed and the second, with the list of speakers, would be released in about a month.

VIth International Symposium and Summer School on Teaching Medicinal Chemistry, UK: 1978 (Dr. Cavalla). Dr. CAVALLA submitted a written report in which he indicated that an *ad hoc* working party of three members of the Committee of the Society for Drug Research had been set up to make plans for this meeting. No decisions had yet been taken. Responsibility for the organization and operation of the Short Course on Teaching Medicinal Chemistry had been accepted by the Further Educational Committee of the

Chemical Society (Chairman, Prof. D. MATHIESON). Applications for financial support to the Ciba Foundation and the Wellcome Trust had been made and rejected. Attention was now being given to the task of raising funds from the pharmaceutical industry.

VIIth International Symposium on Medicinal Chemistry: 1980. An invitation had been received to hold one of the future symposia (1980 or 1982) in Jerusalem. This would be considered. Meanwhile, Dr. THUILLIER would explore the possibility of having the VIIth Symposium in Switzerland with Sweden as an alternative site. There was some discussion about the possibility of holding a future symposium in North America, possibly as a joint venture of CIC and ACS. Consideration would be given to a convenient IUPAC Conference year. This matter would be handled by Prof. CAMPAIGNE and Dr. HUMBER.

Proposed Joint Symposium with IUPHAR. In line with correspondence between Prof. A. S. V. BURGEN of IUPHAR and Prof. ARIËNS, the idea of holding a symposium jointly sponsored by the Section and IUPHAR on some facet of SAR was developed. Meanwhile, a firm offer had been made by the Section on Medicinal Chemistry, Royal Dutch Chemical Society to sponsor such a symposium at Noordwijkerhout provided the Programme Committee be made up of three of their members, two from IUPAC and two from IUPHAR. After discussion, this proposal was accepted with the suggestion that this symposium be called 'Quantitative Structure Activity and Structure Action Relationships – a Critical Appraisal', although the Section deferred to the decision of the Programme Committee on this point. It was also suggested that the meeting be held in 1977 in coordination with the IUPAC Conference and that FIP also be requested to be a joint sponsor. The Section's nominations for the Programme Committee would be Drs. CAVALLA and HUMBER from IUPAC with Prof. R. B. BARLOW as one of the IUPHAR representatives.

8. Reports on Other Items

Data Flagging (Prof. Albert). Prof. ALBERT represented the Section at a meeting on Data Flagging organized by Prof. D. N. HUME at Madrid on 3 September 1975. He reported that although some opposition was expressed, mainly by those who would like a computer system capable of expressing infinite variation adopted in its place, a final vote overwhelmingly supported Flagging. It had been resolved at the meeting to ask the Council to submit it to a year's trial in selected journals.

Food Additives (Prof. Albert). The Section was taking part in two liaisons. The first was with the FAO-WHO Expert Committee on Food Additives which had met in Geneva (14–23 April 1975). This meeting had been devoted to pesticide residues in foods. The second liaison was with the Food Section which had held a Working Party, to examine the Purity Criteria of Food Additives, in the Hague (29 July 1974). The description of the US *Food Chemicals Codex* by Dr. D. F. DODGEN had been the item of greatest interest to our Section. Prof. ALBERT had attended the Food Section Meeting in Madrid on 3 September 1975. Regrettably, food additives figured only lightly on the agenda. However, offers of mutual help were exchanged with the Chairman (Dr. R. MARCUSE) and Dr. D. F. DODGEN (USA).

9. New Business

Liaison with IUB. Prof. HOFFMANN-OSTENHOF had requested closer liaison with the Section because of converging interests such as drug metabolism. He had requested that we appoint two people, one in Europe and one in USA, to represent the Section at IUB meetings. Prof. ARIËNS named Prof. MUTSCHLER as our European representative and Dr. RACHLIN as our US representative. Prof. HOFFMANN-OSTENHOF would be notified officially of these appointments and he would in turn notify the pertinent representative of future IUB meetings. It would be the duty of the representative to attend himself or to arrange for coverage.

Edward Smissman Award. It was noted that the first recipient of the Edward Smissman Award sponsored by Bristol Laboratories was Prof. C. HANSCH.

Directory of Institutions Concerned with Medicinal Chemistry. The possibility of establishing a directory of organizations involved in medicinal chemistry and their directors was discussed. While this would be a mammoth undertaking, the suggestion evoked considerable interest. Dr. RACHLIN would assemble as much data as possible from the correspondents for presentation at the next meeting when a working party would be set up if warranted.

Image of the Pharmaceutical Industry. Prof. SENSI drew attention to a forthcoming symposium 'Industrial Pharmaceutical Research in Italy – Results and International Role' to be held in Rome on 2–4 October 1975. The utility of such symposia to combat the bad image of the industry was discussed and, while the seriousness of the situation was recognized, it was concluded that the problem was too big to be handled by the Section.

Next Meeting. The next Section meeting was scheduled to be held in Paris, just prior to the Vth International Symposium on Medicinal Chemistry, 19–22 July 1976.

10. Election of Members

The following membership list was nominated (those marked with asterisk were the new Members nominated):

Titular Members. Prof. E. ARIËNS, Chairman (1973–77), Dr. A. I. RACHLIN, Secretary (1973–77), Dr. L. HUMBER (1973–77), Dr. J. THUILLIER (1973–77), *Dr. J. CAVALLA (1975–79), *Prof. E. MUTSCHLER (1975–79), *Dr. M. PROTIVA (1975–79), *Prof. S. SAREL (1975–79).

Associate Members (1975–79). Dr. NITYA ANAND, *Prof. R. DAHLBOM, *Dr. W. HOULIHAN, *Dr. TOSHI KOBAYASHI, *Prof. G. B. MARINI-BETTOLO, *Dr. J. MATHIEU, *Prof. W. Th. NAUTA, *Dr. L. TOLDY.

Prof. ARIËNS thanked all outgoing Members for their great contributions to the Section since its inception. These Members, Prof. ALBERT, Prof. CAMPAIGNE and Prof. SENSI, were requested to consider themselves as ‘continuing’ members and all agreed to participate in the Section’s activities as called upon.

MACROMOLECULAR DIVISION COMMITTEE

2 and 6 September 1975

Present: Prof. H. BENOIT (President), Prof. C. G. OVERBERGER (Vice-President), Prof. G. SMETS (Secretary), Prof. E. W. FISCHER, Prof. Y. IWAKURA, Prof. V. A. KABANOV, Dr. A. J. de VRIES (Titular Members); Dr. J. W. BARRETT, Dr. H. CHERDRON, Mr. P. H. FINK-JENSEN, Dr. G. M. KLINE (in part) (Coopted Members); Dr. F. ENGEL, Prof. P. SIGWALT, Prof. P. CORRADINI (in part), Prof. M. MANDEL, Prof. B. PHILIPP (in part), Prof. J. FONTAN, Prof. D. PEPPER (National Representatives); Prof. G. W. BECKER (Representative of IUPAP).

1. Minutes of Previous Meeting

The minutes of the previous meeting held in Madrid on 16 September 1974 [see *Inf. Bull.* No.) 49 (March 1975), pages 63–66] were approved.

2. Sponsorship of Symposia/Microsymposia

The following macromolecular symposia (a), and microsymposia (b) had been sponsored by IUPAC:

1975

- (a) International Symposium on Macromolecules (3rd Katzir Conference), 13–18 July, Jerusalem, Israel (Prof. SILBERBERG).
- (b) Microsymposia:
 - Polymerization of Heterocycles, Jablonna-Lodz, Poland, 24–27 June (Dr. S. PENCZEK and Prof. P. REMPP).
 - Modified Polymers, Their Preparation and Properties, Bratislava, Czechoslovakia, 1–4 July (Dr. ROMANOV).
 - 15th Prague Symposium: Degradation and Stabilization of Polyolefins, Prague, Czechoslovakia, 21–25 July (Dr. SEDLÁČEK).

1976

Only Microsymposia (b) had been scheduled for 1976.

- Photochemical Processes in High Polymers, Leuven, Belgium, 2–4 June (Prof. G. SMETS).
- Polyvinylchloride, Lyon-Villeurbanne, France, 5–9 July (Dr. A. GUYOT) [Division Committee recommended that during this symposium a panel discussion should be organized on Vinylchloride Monomer and -Oligomers, and their Toxicological Effects].

- 16th Prague Symposium: Advances in Scattering Methods, Prague, Czechoslovakia, 12–16 July (Dr. SEDLÁČEK).
- 5th Discussion Conference on Macromolecules: Phases and Interfaces in Polymer Systems, Prague, Czechoslovakia, 12–16 July (Dr. POUCHLY).
- Long-term Properties of Polymers and Polymeric Material, Stockholm, Sweden (Prof. B. RANBY). [Division Committee recommended that the 'changes of physical properties during ageing processes' be considered a topic for this Symposium.]

1977

- (a) Macromolecular Symposium to be held in Tokyo, Japan, 4–10 September, within the XXVIth Congress of IUPAC. Prof. Y. IWAKURA provided information about the organization and on the main topics of this meeting.
 - Macromolecular Symposium to be held in Dublin (Ireland), 18–22 July (Prof. D. C. PEPPER). [After a broad discussion, it was recognized that provided some changes in the programme of the Dublin meeting were introduced, there would be no overlapping between the Tokyo and Dublin Symposia. Consequently, Division Committee agreed to sponsor also the Dublin meeting. Prof. PEPPER agreed to take these suggestions into account.]
- (b) Prof. P. PHILIPP had plans to organize a Microsymposium on Polymer Dispersions (Chemistry and Physics) in May–June 1977 in Dresden (German Democratic Republic).

3. Election of Members

It was agreed to organize the elections following the new Statutes and By-laws to be adopted by the Council in Madrid. It was decided in order to assure continuity and in agreement with the suggestions of the Division's bureau to proceed first to the election of the Vice-President (President-Elect) and the Secretary of the Division. Prof. V. A. KABANOV had been elected at the first run with 13 votes (for 14 expressed); Dr. A. J. de VRIES had been elected at the first run with 12 votes (one abstention).

The Secretary had received twenty nominations for Titular Membership of Division Committee. The adopted vote procedure consisted in two steps: first the election of three candidates, secondly the election of further three other Titular Members.

The names of the proposed candidates were written on one bulletin. The

following results had been obtained:

- A. NAKAJIMA (Kyoto Univ.)
- R. C. SCHULZ (Mainz, FRG)
- C. H. BAMFORD (Liverpool, UK)
- F. H. WINSLOW (Bell Teleph., Murray Hill, USA)
- P. CORRADINI (Napoli, Italy)
- F. TÜDÖS (Hungarian Acad., Budapest)

It was agreed to apply to the coopted members the same rules as for the titular members, i.e. the duration of their mandate is limited to 4 consecutive years. Following this rule only Dr. BARRETT and Mr. P. H. FINK-JENSEN could stay on for 2 more years; all the other members had to resign.

After discussion and on proposal of the President, the following members were elected:

- Prof. M. MANDEL, Leiden Univ., The Netherlands
- Prof. O. WICHTERLE, Academy Prague, CSSR
- Dr. D. HEINZE, BASF Ludwigshafen a.Rhein, FRG
- Dr. J. H. SAUNDERS, Monsanto Textiles, Pensacola FL, USA
- Dr. A. KEPES, CDF-Chimie Courbevoie, France
- Dr. V. VAKULA, Moscow, USSR
- Prof. G. SMETS, Leuven, Belgium*

*It was understood that in the case of his election as President-elect of IUPAC, Prof. G. SMETS would resign. It had been suggested by the bureau of the Division to replace him by Prof. Y. IWAKURA, former Titular Member (approval Bureau IUPAC was required).

- Dr. G. M. KLINE (USA) would act as ISO Observer in the MMD.
- In agreement with the Statutes and By-laws, the representative of IUPAP had no voting rights. Considering the interdisciplinary character of MMD it was decided to apply to the Bureau of IUPAC for an exception to this rule, consequently, if accepted, Dr. BECKER would be entitled in the future to participate in all votes and elections of MMD.

4. Activities of Commissions

Commission on Macromolecular Nomenclature IV.1. Dr. K. L. LOENING's report as Chairman of Commission IV.1 on the activities of his Commission is published in a following section. The new composition of Commission IV.1 as given hereunder, was presented by Dr. LOENING and adopted by the Division Committee.

Titular Members: Dr. K. L. LOENING (Chairman), Dr. R. B. FOX (Secretary),

Prof. P. CORRADINI*, Prof. A. D. JENKINS, Prof. N. PLATÉ, Dr. W. RING, Prof. P. SIGWALT, Prof. T. TSURUTA.

Associate Members: Dr. L. C. CROSS, Prof. N. M. BIKALES, Prof. G. SMETS†.

* Owing to his election as Titular Member of the Division Committee Prof. CORRADINI offered to resign, and suggested to be replaced by Prof. G. ALLEGRA (Polytech., Milano, Italy). Approval of the Bureau of IUPAC was required.

† If elected as President-elect of IUPAC, Prof. SMETS would resign

Commission on Polymer Characterization and Properties IV.2. A meeting was held on 3 September 1975 to decide on actions necessary to formalize this new Commission already agreed by the Council. Present at the meeting were: Prof. H. BENOÎT (Division President), Prof. C. G. OVERBERGER (Division Vice-President), Dr. J. W. BARRETT (Chairman, Commission IV.2), Dr. A. J. de VRIES (Chairman, Working Party on Structure and Properties of Commercial Polymers), Mr. P. H. FINK-JENSEN (Chairman, Working Party on Supported Polymer Films), Prof. G. W. BECKER (IUPAC Representative).

The following actions and recommendations were agreed

- (i) Mr. FINK-JENSEN, Chairman of the Working Party on Supported Polymer Films, to be a Member of the Commission until this Working Party gained acceptance as a separate Commission.
- (ii) The Chairmen of the other three Working Parties to be Members of the Commission:
 - Dr. de VRIES — Structure and Properties of Commercial Polymers,
 - Dr. BALL — Molecular Characterization of Commercial Polymers,
 - Dr. WILSKI — Thermodynamic Properties of Polymers.
- (iii) With the Chairman, Dr. BARRETT, this would make five Titular Members of the Commission and the vacant sixth place would be filled later. (It was noted that Prof. BENOÎT and Prof. OVERBERGER were both *ex-officio* Members of the Commission.)
- (iv) This membership of the Commission would be formally recommended by the Division President to the Bureau on 8 September. Dr. BALL and Dr. WILSKI would be formally advised of their positions as new Chairmen of Working Parties by Prof. OVERBERGER.
- (v) The responsibilities of the new Commission would be as described in the memorandum of 25 August 1973 to the Bureau. Working Parties would continue to report directly to the Division at its meeting during each IUPAC Conference.

(vi) A preliminary discussion on new topics possibly needing new Working Parties suggested that further consideration should be given to:

- (a) Combustion Properties of Polymers,
- (b) Diffusion and Permeability of Low Molecular Weight Species in Polymers,
- (c) Electrical Properties of Polymers,
- (d) Surface Properties of Synthetic Polymer Fibres,
- (e) Elastomer Properties.

The broadest possible discussion would be organized on new topics and it was concluded that Divisional discussion in 1976 was advisable. A Divisional meeting largely concerned with this was suggested for 4 July 1976 in Lyon or Paris.

(vii) Present Working Parties were heavily biased to European membership. It was agreed that consideration would be given to the possibility of some new Working Parties to be biased towards American membership and to greater collaboration with existing Japanese groups.

5. Reports of the Working Parties

Three reports were presented during the meeting by

- (i) Dr. A. J. de VRIES on Structure and Properties of Commercial Polymers,
- (ii) Prof. H. BENOÎT on Molecular Characterization of Commercial Polymers,
- (iii) Mr. P. H. FINK-JENSEN on Supported Polymer Films.

After discussion of each report, a secret ballot was held in agreement with the internal rules of the Division; further continuation of Working Parties (i) and (ii) was decided unanimously. Working Party (iii) was also maintained. It was decided that Mr. FINK-JENSEN would introduce before 31 December 1975 to the Division President well-defined research programmes. These programmes would be discussed at the next meeting of the Commission IV.2 (tentatively fixed for July 1976 in Lyon or Paris – exact date to be fixed by Prof. OVERBERGER).

COMMISSION ON MACROMOLECULAR NOMENCLATURE (IV.1)

2–6 September 1975

Present: Dr. K. L. LOENING (Chairman), Dr. R. B. FOX (Secretary), Prof. P. CORRADINI, Dr. L. C. CROSS, Prof. N. A. PLATÉ, Dr. W. RING, Prof. G. SMETS, Prof. T. TSURUTA (Titular Members); Prof. P. SIGWALT (Associate Member); Dr. G. M. KLINE (Corresponding Member, ISO). Also present for part of the sessions were Prof. R. MARCHESSAULT and Prof. H. BENOÎT.

1. Minutes of Previous Meeting

The minutes of the previous meeting held at Santiago de Compostela on 7–10 May 1974 [see *Inf. Bull.* No. 48 (October 1974), pages 46–47] were approved.

2. Composition of the Commission

In Executive Session, the Commission recommended that Prof. PLATÉ and Dr. RING be reappointed to 4-year terms; Prof. A. D. JENKINS (UK) and Prof. SIGWALT be appointed to 4-year terms as Titular Members; that extended appointments be given to Prof. CORRADINI, Dr. FOX, Dr. LOENING, and Prof. TSURUTA; and that Prof. BIKALES, Dr. CROSS, and Prof. SMETS be appointed Associate Members of the Commission. Dr. LOENING and Dr. FOX were re-elected Chairman and Secretary, respectively.

3. Activities Since the Previous Meeting

The publication of final documents: (i) List of Standard Abbreviations (Symbols) for Synthetic Polymers and Polymeric Materials in *Pure Appl. Chem.* **40**, No. 3, 475–6 (1974); and (ii) Basic Definitions of Terms Relating to Polymers in *Pure Appl. Chem.*, **40**, No. 3, 477–91 (1974), was noted. Prof. PLATÉ advised the Commission that the substance of (i) had now been recommended for the use of authors in *Vysokomolekul. Soed.* The Commission had also learned that the use of the structure-based polymer nomenclature published as Provisional Nomenclature Appendix No. 29 to IUPAC *Inf. Bull.* was now required of authors in *Makromol. Chem.*

4. Rheological Terms and Symbols

In a joint meeting with Commission on Colloid Surface Chemistry and a

discussion of terms related to viscosity had led to the following recommendations in a tentative document of that Commission:

- (i) η_s, η_m : viscosity of the solvent or the continuous medium,
 - (ii) η_0, η_∞ : limiting viscosity at zero and infinite shear rate, respectively,
 - (iii) $\eta_r (= \eta/\eta_s)$ *relative viscosity* or *viscosity ratio*,
 - (iv) $(\eta_r^{-1})/\rho_D$: reduced viscosity or viscosity number, where ρ_D is the mass concentration of the dispersed phase
 - (v) $[\eta] := \left(\lim_{\rho_D \rightarrow 0} \frac{\eta_r^{-1}}{\rho_D} \right)$ *intrinsic viscosity* or *limiting viscosity number*,
 - (vi) $\eta_{inh} := \left(\frac{1}{\rho_D} \ln \eta/\eta_s \right)$ *inherent viscosity* or *logarithmic viscosity number*,
- The symbol η_{1n} had been suggested but not adopted for these terms.
- (vii) The use of the term 'specific viscosity' (for η_r^{-1}) was discouraged. It had been suggested but not adopted that the term 'relative viscosity increment', symbol η_i be used for η_r^{-1} .

5. Polymer Classification and Family Names

Prof. PLATÉ presented a refined version of the Korshak proposal for polymer classification based on the concept of homochain and heterochain polymers. A classification proposal by W. A. LEE (1975) based on the structure-based nomenclature of Appendix No. 29 was received too late for discussion. The Commission considered the Korshak proposal to be a simple and logical one, as are a number of others [see O. Leuchs, *Pure Appl. Chem.*, **16**, 494 (1968)], but that such classification systems might be better viewed as a framework for an elaboration of polymer family names, a project to be undertaken by the Commission.

- (i) A Working Party consisting of Prof. PLATÉ (Chairman), Prof. SIGWALT, Dr. CROSS, and Dr. KLINE was established to consider the problem of definitive family and sub-family names for polymers. Initial attention of the Working Party would be focussed on regular polymers.
- (ii) Prof. SIGWALT led a discussion of the meaning of the terms 'aramide' and 'polyamide' in the context of the proposals of ISO/TC 38/SC 17, Jan. 1975, on generic names for man-made fibres. The Commission supported the position of Prof. SIGWALT that 'polyamide' should not be restricted to the class of aliphatic polyamides and that 'aramide' should be a subclass of 'polyamides'. The Commission strongly urged

that 'polyamide' as a term be reserved for the family of polymeric materials of the amide type (in ISO terminology), including those containing either or both aliphatic and/or aromatic groups.

6. Commission-Related ISO Activities

Dr. KLINE reviewed the status of proposals and addenda related to ISO/R 1043 (Abbreviations and Symbols for Plastics), ISO/R 472 (Definitions), and ISO/R 194 (Equivalent Terms in Various Languages). The industrial orientation of ISO was noted; Dr. KLINE observed that ISO relied heavily on IUPAC in areas such as basic definitions. Dr. KLINE also commented on the need for official texts to be in a number of languages. The Commission agreed that translation of its documents into languages other than English was desirable, but that at the present time it was in a position only to review translations that were in languages in which its members were fluent.

7. Miscellaneous Nomenclature Matters

Interpenetrating Polymer Networks and Graft Copolymers. Proposals for a nomenclature based on reaction sequences, allowing for computerized synthesis for certain types of copolymers and blends, were considered with interest. No action was taken.

Inorganic Polymer Nomenclature. A document received from the Nomenclature Committee of the Division of Polymer Chemistry of the American Chemical Society (ACS) was reviewed briefly.

A Working Party consisting of Dr. LOENING (Chairman) and Dr. FOX would meet Prof. FERNELIUS and Dr. POWELL of the Commission II.2 to consider the substance of the ACS document in greater detail.

Copolymer Nomenclature. To consider further the problems of copolymer nomenclature, a Working Party was established, consisting of Dr. RING (Chairman), Dr. FOX, Prof. PLATÉ, and Prof. SMETS. This Working Party would report at the next meeting of the Commission.

Subsidiary Definitions. These were not discussed explicitly at this meeting, but a Working Party was formed, consisting of Prof. TSURUTA (Chairman), Prof. BIKALES, Prof. CORRADINI, Prof. JENKINS, Dr. KLINE, and Prof. MARCHESSAULT. The Working Party was to consider, among other things, including rheological terms among the subsidiary definitions.

Structure-based Nomenclature. The Commission recommended the publication as a final document in *Pure Appl. Chem.* 'Nomenclature of Regular

Single Strand Organic Polymers' which had initially been published as Provisional Nomenclature Appendix No. 29 (November 1972) to *Inf. Bull.* The Commission had discussed the proposed amendments to the provisional document. Many had been derived from the substantive decision to change the principle of minimizing free valences from highest priority to a position of low priority, necessitating a redefinition of a regular single-strand polymer. 'A regular single strand polymer is one whose molecules can be described by constitutional repeating units with only two terminals, each having one atom.'

8. Date and Place of Next Meeting

The Commission tentatively agreed to hold its next meeting during or close to the second week of June 1976 in Dorking, UK. Dr. CROSS would make the arrangements.

ANALYTICAL CHEMISTRY DIVISION COMMITTEE

2, 3, 6 and 7 September 1975

Present: Prof. N. TANAKA (President), Prof. W. KEMULA (Past President), Mr. R. W. FENNELL (Secretary), Prof. D. N. HUME, Prof. H. KAISER, Prof. O. SAMUELSON, Prof. YU. A. ZOLOTOV (In part, by invitation); Prof. H. FREISER, Prof. F. PELLERIN, Prof. E. PUNGOR, Dr. J. C. WHITE (newly elected Committee Members), Prof. R. G. BATES, Prof. R. BELCHER, Dr. M. B. A. CRESPI, Prof. V. A. FASSEL, Prof. H. M. N. H. IRVING, Dr. O. G. KOCH, Prof. G. H. NANCOLLAS (Commission Chairmen).

1. President's Opening Remarks

The president recalled the death of Dr. A. C. MENZIES and Prof. C. L. WILSON and asked the Members to stand for a moment in memory of these former colleagues. Prof. TANAKA said that his biennial Report to Council indicated that progress of work within the Division had been good; even so several problems existed, which would have to be discussed in depth during this Conference, including the future programme of the Division, the standard and style of publications and relations with other bodies (especially ISO).

2. Minutes of Previous Meetings

The minutes of the Division Committee meeting in Munich (1973), as published in *Comptes Rendus XXVII Conference* (Part B, pages 179–184), were approved.

The minutes of the Division Executive Committee meeting in Warsaw (1974), as published in *Information Bulletin* No. 49 (pages 51–53), were considered and, after amplification by the Secretary, the decisions taken were approved.

3. Election of Committee Members

Report of N/E Committee 1973–75. The Secretary reported, on behalf of the Chairman of the N/E Committee, the results of the election. Those elected were:

Prof. G. DUYCKAERTS (Belgium)
Prof. H. FREISER (USA)
Prof. F. PELLERIN (France)

Prof. E. PUNGOR (Hungary)

Prof. S. B. SAVVIN (USSR)

Dr. J. C. WHITE (USA) – Division Secretary-Elect

The Secretary was asked to thank the Members of the N/E Committee for their work.

Election of N/E Committee 1975–77. The Secretary was given instructions on the establishment of the Membership of the Committee by correspondence.

Election of Vice-President (President-Elect) 1975–77. The election of Prof. T. S. WEST (UK) as Vice-President (President-Elect) by the Division Committee (by correspondence) was formally announced by the Secretary.

4. Division Finances

The President said that no funds, in addition to those required for travel and subsistence for Titular Members attending the Conference, had been allocated to the Division for 1975. The IUPAC Treasurer had stated in 1974 that any funds remaining from that year's allocation could be carried over into 1975. Only the rigid control he had exercised over expenditure during 1974 had enabled reimbursement of administrative expenses to members and representatives to be sent to two important meetings. Based on past experience, Division President had submitted a much more realistic estimate of the Division's requirements than had resulted from the previous method of forecasting expenditure. However, even if the full amount requested was allocated to the Division, there could be no relaxation in control and proposals for expenditure would have to be made well in advance so that the Division President could assess their relative merits and allocate funds to the best advantage to the work of the Division.

5. Sponsorship of Symposia

A list of four meetings, whose application for IUPAC sponsorship had been supported by the Division, was in the Committee file. Prof. KAISER outlined the background of the Colloquium Spectroscopicum Internationale and pointed out that the 1975 meeting occurred on the 25th anniversary of the series. In reply to an inquiry, the Secretary said that he thought that, provided the conditions for IUPAC sponsorship were always met, it was a legitimate activity of Commission V.4 to include assistance in the organization of such colloquia as an official Commission project.

After discussion of the basis upon which Division support was given, it was suggested that a memorandum should be sent to the Bureau suggesting that it could be useful for the application form to contain more detail than had often been the case on the topics to be covered and to state the languages to be used for delivery of papers and plenary lectures.

6. Statutes, By-laws and Division Rules

Draft Revised Statutes and By-laws. A copy of the draft revised By-laws concerning the operation of Divisions was in the Committee file. Those most affecting existing practice (B4.104 and B4.304) were discussed by the Committee and it was agreed that Prof. TANAKA should present the Division's views on B4.103 and B.104 at the Division Presidents' Meeting.

Division Rules. Mr. FENNELL had been requested by the Committee to draft an addendum to Division Rule 3.303 to the effect that proposals for Titular Membership of a given Commission by more than one member of a single institute should be discouraged. The general principle had been endorsed by correspondence but the exact wording had not been settled. It was agreed that the following addendum should be made to Rule 3.303: 'Two or more members of a single institute may serve as Titular Members of a given Commission at one time only in exceptional circumstances.' The Secretary reported that he had received a complaint that the inclusion of the names of Division Members nominating candidates for election (Rule I.309) on the ballot papers could be regarded as an attempt to influence the electorate. On the other hand, he had received complaints after the 1967 elections (before the election rules required their inclusion) that the names were *not* on the ballot papers. It was agreed that the Rule should be left as it was.

7. Collaboration with other Bodies

Applied Chemistry Division. It had been agreed by the respective Division Presidents that it was essential that the respective Divisions should maintain actively their cooperation. Following a joint meeting of the two Division Committees, it was agreed that Prof. H. FREISER should act as the Analytical Division's link with the Applied Chemistry Division on the proposed Symposium on Harmonization of Collaborative Studies. It had been agreed at the joint meeting that the Division Secretary would provide, at least initially, the line of communication on Division programme items and particularly on the ICAG request for coverage of the problem of trace elements in animal tissues.

Interdivisional Committee on Nomenclature and Symbols. Prof. McGLASHAN's proposals of 16 August 1974 had been circulated to all Members of the Division Committee and to the Chairmen of Commissions engaged on nomenclature-type projects. Although all had agreed that the Interdivisional Committee had never worked properly, with only two exceptions had anything but outright condemnation of the proposals been received.

The Committee was pleased to note that the IUPAC President, in his letter of 4 June 1975, had come to the conclusion that the above proposals were not necessary and that the Committee should operate in the manner originally intended. The Committee expressed the hope that the needs of practical working chemists would be fully represented by the membership of the Interdivisional Committee.

International Organization for Standardization (ISO). It was noted that, following experience with the requests for comments on ISO Draft International Standards, that the original proposals for a mechanism for signifying IUPAC approval for International Standards had been withdrawn by Division pending further discussion by the Division Committee. It was also noted that the Bureau was anxious to maintain and, if possible, extend present collaboration with ISO.

The original scheme was modified after some discussion and an outline of the proposed mechanism, in two stages, for the clearing of ISO Standards for IUPAC approval prepared for submission to the Bureau. These new proposals were regarded by the Committee as being satisfactory for ISO documents referred to one Division only. Some alternative scheme would be necessary at the final stage if more than one Division was involved. In any case the Division would require the Bureau's decision on the person with authority to grant IUPAC approval.

The Committee was pleased to see that, in the report of the IUPAC representative to the recent ISO/TC 47 meeting, the comments by IUPAC personnel were to a large extent being utilized in the redrafting of ISO standards. It was agreed, after discussion with the Chairman of Commission V.1, that it was not necessary to appoint a permanent IUPAC representative on ISO/TC47/SC 3, as this Subcommittee had met only once during the last years, and that invitations to attend ISO Technical Committee or Subcommittee meetings would be considered in the light of the subject-matter of the agenda and the locality of the meeting.

8. Division Programme

Progress 1973–75. The work completed and still in progress in the Division,

as summarized in the President's Report to Council and detailed in the Commission Status Reports, were considered. The Committee was impressed by the amount of work done by Commission Members but had been disappointed occasionally by the standard of reports coming to them for review. The Secretary explained the three methods of publication currently available – in the *Information Bulletin*, as a *Technical Report*, or in *Pure and Applied Chemistry* (publication of provisional nomenclature reports as Appendices to the *Information Bulletin* was a mid-way stage before publication in *Pure Appl. Chem.*). The IUPAC Publications Committee was responsible for the final decision on the form of publication of a report but there seemed to be no reason why a Division could not propose a particular method. The Secretary said he had been unable to get any firm statement on the different requirements for publication either in *Pure Appl. Chem.* or as *Technical Report*. He was asked to pursue this question with the Secretariat.

It was noted that there were two distinct styles of nomenclature report being produced by different Commissions in the Division. The advantages and drawbacks of each style were discussed and it was agreed to ask Profs. KAISER and WEST to correspond on the question of the essential requirements for each style and to report back to the Division Committee in advance of the date (to be arranged) of the Division Executive Committee meeting in 1976. The Secretary was asked to remind Commission Chairmen that *all* nomenclature reports should be submitted to Commission V.3, to check for concordance with published IUPAC nomenclature, at an early stage and that documents must be in good English and in consistent form before being submitted for Committee approval.

Programme and Personnel 1975–77. The Division Committee discussed at great length the policy to be pursued in the future in relation to the objects of IUPAC as defined in the Statutes, the past achievements of the Division and the stated requirements of the International Company Associates Group. The Secretary was instructed to inform Commissions that the Committee would view proposals for future programmes in the following order of priority: Nomenclature; Standardization of methods for generating or reporting data; Data compilation (including organization of international effort in this field); Recommendation of methods of analysis and reagents; International inquiries on use of techniques, etc. ('Gallup investigations'); Literature reviews – a specific need must be established. The matter was raised at the Open Meeting of the Division and it was agreed that the priority list was for general guidance and could be varied in special cases.

The Conference Reports from the Commissions were reviewed in the presence of the Commission Chairmen and the proposed programmes and personnel for 1975–77 were agreed after minor amendments.

9. Matters Arising from the Division Open Meeting

Publications. The view had been expressed that it was doubtful whether reports from IUPAC bodies were widely enough read and that a more aggressive and open publication policy would be advantageous, for example that Commissions should be allowed to publish reports without reference to higher authority and possibly in other than IUPAC journals. On the other hand, in order to maintain the high standard expected of IUPAC publications, it was argued that Division Committee and Publications Committee control was essential and it was noted that an experiment in publication procedure proposed by the Publications Committee had been turned down by the Commission concerned. It was agreed that the Division Committee should consider this subject in the light of any changes in IUPAC policy consequent upon the new contract with the official IUPAC publisher and its comments would be discussed by the Division Executive Committee in 1976.

Statutes and By-laws. The matters raised by Prof. BELCHER were discussed and it was agreed that the Division would continue to keep in mind all aspects of the organization and functions of the Union.

10. Other Business

Federation of European Chemical Societies. It was noted that a symposium organized by the Federation had taken place shortly before the IUPAC Conference. It was suggested that these meetings might be organized in even-numbered years in order to avoid clashes with the odd-year IUPAC Conferences and Congresses. It was thought that the FECS meetings were triennial and hence clashes were bound to occur. The Secretary was nevertheless asked to raise the matter with the Secretariat.

Approval of Reports. Nomenclature reports, to which minor amendments had been made during the Conference, were approved for submission to Council.

11. Concluding Remarks

The President ended the meeting by thanking Prof. KEMULA for his help and advice as retiring Past President, Mr. FENNELL for his work as Secretary and the other retiring Members of the Committee for their valuable assistance.

COMMISSION ON ANALYTICAL REACTIONS AND REAGENTS (V.1)

3–5 September 1975

Present: Prof. R. BELCHER (Chairman), Prof. F. PELLERIN (Secretary), Dr. J. BARTOS, Dr. A. HULANICKI, Dr. M. KAPEL, Mr. F. J. REIDINGER (Titular Members); Prof. J. INCZÉDY (Associate Member). Prof. F. LUCENA CONDE (Associate Member) attended a meeting on 7 September with several of the above-mentioned Members.

1. Minutes of Previous Meeting

The minutes of the meeting held in Paris on 7 May 1974 had been published in *Inf. Bull.* No. 48 (October 1974), pages 44–46.

2. IUPAC–EEC Contract

A note on the relations between IUPAC and EEC had been sent by Prof. TRUHAUT to the Chairman and to the Secretary of the Commission. The EEC had been prevented from presenting a contract for 1975, organizing a meeting between IUPAC and EEC and discussing or commenting methods of former contracts. Sir HAROLD THOMPSON and Prof. TRUHAUT had met EEC officers in Bruxelles in June 1975. A new contract would be established for 1976, EEC would give the list of methods to be studied by IUPAC. Commission V.1 was to participate in this work as previously and was waiting for instructions from the Coordinating Committee.

3. Technical Reports on Functional Group Analysis

Dr. BARTOS presented various comments and suggested several rules according to which each report should be written in order to avoid any lack of homogeneity. After much debate, the following decisions were reached:

- Each report would be preceded by a general introduction.
- Whenever necessary, IUPAC Secretariat would be asked for permission to reproduce methods already published in books.
- All methods would be presented in compliance with several recommendations. They concerned the reagents (all reagents and solvents would be listed), the instructions (active voice and imperative mood was to be used), the concentrations (w/v, v/v, molarities), the abbreviations (ml, nm, etc.), the accuracies of the given weights, volumes and temperatures, etc.

4. Recommended Methods for the Determination of Amines

This report had been approved in Munich. Dr. KAPEL would revise it editorially in pursuance of item 3 and would send the revised draft to Dr. BARTOS for approval. Prof. BELCHER would receive it in January 1976 and forward it to the Division Committee.

5. Colorimetry and Fluorimetry of Carbonyl Compounds and of Steroids

The reports prepared by Drs. BARTOS and PESEZ were discussed and accepted by the Commission. Dr. BARTOS would revise them editorially in pursuance of item 3 and send them during the course of the first quarter of 1976 to Prof. BELCHER who would dispatch them to the Division Committee.

6. Redox Indicators

Dr. HULANICKI had received comments from Members of the Division Committee. They were taken into account by the Commission. The report would be presented as a 'Technical Report'. It would be accordingly finalized by Dr. HULANICKI and sent to the Division Committee by Prof. BELCHER in January 1976.

7. Compleximetric Indicators

The report presented by Dr. HULANICKI was discussed and accepted. Members of the Commission would send their comments and remarks direct to Dr. HULANICKI before January 1976. Comments were particularly asked for the list of compounds, their names and synonyms, the criteria of purity actually adopted in different countries, etc.

8. Expression of Results in Colorimetry and Fluorimetry

Dr. BARTOS proposed a new draft based on the comments he had received on the report presented in Paris in 1974. This draft was discussed, and it was agreed that the data which, according to the authors, should be included in papers dealing with colorimetric and fluorimetric determinations should be considered as additional information aimed at facilitating comparisons for those who were mostly interested in experimental results. Copies of the draft were forwarded to Commission V.3. Members of Commission V.1 should send their comments direct to Dr. BARTOS before February 1976. The project would be studied again at the next meeting of the Commission in May 1976.

9. Studies on 'Acid-Base Indicators' and 'Determination of Polyphenolic Compounds'

The first drafts dealing with preliminary studies on 'acid-base indicators and non-aqueous solvents' and on 'identification and determination of polyphenolic compounds' presented by Prof. PELLERIN were discussed. Prof. PELLERIN would continue his work. The study of acid-base indicators in non-aqueous solvents would be limited to their chemical definition and to the criteria of identification and purity of these compounds. Theoretical aspects of their use in non-aqueous solvents would only be summarized in a general introduction.

The study of polyphenols would be continued according to the general scheme proposed by Prof. PELLERIN. It would include spectrophotometric (UV, visible, IR), fluorimetric and chromatographic (GLC, TLC) methods of detection. Recommended methods of determination of polyphenolic compounds might prove useful for the detection and estimation of antioxidants.

10. Relations between IUPAC and ISO

Dr. BARTOS had acted as the official representative of IUPAC at the meeting of ISO/TC 158 held in Paris in April 1975. He presented to the Commission the comments he had sent to IUPAC Secretariat. In Munich, Commission V.1 had proposed that Dr. STEPHEN should be responsible for liaison between the Commission and ISO. From the discussion, it was concluded that, up to now, relations between Commission V.1 and ISO had not been clearly defined. The Commission was expecting further instructions from the Division Committee.

11. Standard Substances

The question of primary standards for titrimetric analysis was restated by Prof. BELCHER. The study would continue under his directions.

12. New Projects

After a general discussion, the Commission proposed that the following projects be taken into consideration for future studies:

- Determination of organostannic compounds (Prof. PELLERIN).
- Determination of heavy metals (Pb, Cu, Cd) in organic compounds (particularly in food additives) by atomic absorption spectrometry (Prof. PELLERIN).

13. Membership

Titular Members. The Commission had proposed to renew for 2 years the membership of Prof. BELCHER (Chairman), Prof. SIGGIA, Dr. BARTOS and Dr. KAPEL. Dr. INCZÉDY was proposed as Titular Member and Dr. HULANICKI as Secretary to the Commission (1976–79). Other Titular Members were Dr. REIDINGER and Prof. WEISZ.

Associate Members. The Commission had proposed to renew for 2 years the membership of Prof. LUCENA CONDE, Dr. PESEZ and Dr. STEPHEN. Prof. PELLERIN was proposed as an Associate Member, together with Prof. G. ACKERMANN (German Democratic Republic), Prof. YU. A. BANKOWSKI (USSR), Prof. N. JORDANOV (Bulgaria) and Prof. G. DEN BOEF (Netherlands). Prof. G. DUYCKAERTS (Belgium) was proposed as an Observer.

In making these proposals, the Commission had essentially taken into consideration the fact that, in order to avoid major disturbances, various studies now in progress should remain under the supervision of the members who had started the work, whereas new Members could be asked to consider several future projects.

14. Next Meeting

The Commission proposed to meet in Paris on 11 May 1976, in order to discuss the methods proposed by EEC in the 1976 Contract and possibly to examine reports now under study.

COMMISSION ON MICROCHEMICAL TECHNIQUES AND TRACE ANALYSIS (V.2)

4–6 September 1975

Present: Dr. O. G. KOCH (Chairman), Prof. K. L. CHENG, Prof. S. GOMIŠČEK, Prof. A. MIZUIKE, Prof. G. H. MORRISON, Dr. E. A. TERENT'EVA (Titular Members); Dr. M. GRASSERBAUER (Associate Member).

1. Minutes of Previous Meeting

The minutes of the meeting in Munich, during 23–25 August 1973, had been published in *Comptes Rendus XXVII Conference* (Part B, pages 187–189).

2. Reports

The following reports had been published or were in the course of publication:

- (i) Trace Analysis Applicable to the Determination of Minor Impurities in Chemicals – I: General Survey (M. PÍNTA), *Pure Appl. Chem.*, **37**, 483 (1974).
- (ii) General Aspects of Trace Analytical Methods – I: Methods of Calibration in Trace Analysis (G. H. MORRISON), *Pure Appl. Chem.*, **41**, 395 (1975).

The following reports had been submitted for publication:

- (iii) Trace Analysis Applicable to the Determination of Minor Impurities in Chemicals – III: Application to High Purity Mineral Acids (M. PÍNTA).
- (iv) The Present Status of Methods for the Microdetermination of Fluorine in Organic Compounds (A. M. G. MACDONALD).

The following reports were under revision considering the comments from the Analytical Chemistry Division Committee:

- (v) A Study of the Accuracy and Precision of Carbon and Hydrogen Determination in Organic Compounds Containing Heteroelements (N. E. GEL'MAN).
- (vi) General Aspects of Trace Analytical Methods – II: Destruction of Organic Matter. Preconcentration of Elements for Trace Analysis (K. L. CHENG).

The following report had been submitted to the Analytical Chemistry Division Committee for approval:

- (vii) General Aspects of Trace Analytical Methods – III: Standard Reference

Materials for Trace Analysis. Part 1. Present Status of Availability and Application (O. G. KOCH).

3. Projects Completed

General Aspects of Trace Analytical Methods — III: Standard Reference Materials for Trace Analysis. Part 2. Available Standard Reference Materials (1971–1975: Project leader O. G. KOCH).

4. Projects in Progress

- (i) General Aspects of Trace Analytical Methods — IV: Contamination in Trace Analysis (Started 1973 — Project leaders: MIZUIKE and PÍNTA. Completion date: March 1976). This project had almost been completed. Additional information from some countries would be collected for inclusion.
- (ii) *Ibid.* — V: Trace Analysis of Surfaces (Started 1973 — Project leaders: MORRISON, CHENG and GRASSERBAUER. Completion date: February 1977). A preliminary review of the various techniques was presented. In the second stage a detailed evaluation of surface methods was in progress.
- (iii) *Ibid.* — VI: Stability of Synthetic Standards: Solutions (Started 1973 — Project leader: GOMIŠČEK. Completion date: November 1976). The results of experiments and an inquiry were presented. A comparative study would complete the project after which the report would be revised.
- (iv) *Ibid.* — VIII: The Applicability of Destruction under Pressure to the Trace Analyses of Biological Materials (Started 1973 — Project leader: GOMIŠČEK. Completion date: November 1975). The project had almost been completed and the report would be revised.
- (v) The Analysis of Organoboron Compounds (Started 1973 — Project leaders: GEL'MAN, MACDONALD and TEREŇ'EVA. Completion date: February 1977). High purity standards were prepared, the corresponding methods were reviewed. The list of the participating laboratories and the plan of experiments were set up. In the second stage an inter-laboratory study would be performed.
- (vi) General Aspects of Trace Analytical Methods — IX: Practical Limits of Determination of Trace Analytical Methods (Started 1973 — Project leaders: KOCH, MORRISON, PÍNTA and LaFLEUR. Completion date:

March 1977). The data for absorption spectrophotometry, atomic absorption, atomic fluorescence and X-ray spectrometry were compiled and presented. The report would be completed with values for the other methods. This project was requested in discussions between representatives of the Analytical and Applied Chemistry Divisions at the IUPAC Conference in Munich in August 1973. Commission V.2 was asked to undertake this project. The original title 'Sensitivities of Trace Analytical Methods' was changed to the above.

5. Proposed New Projects

An important continuing activity of the Commission was the review of the present status of the different techniques and the standardization of methods. Therefore the following projects had been proposed.

- (i) Separation and Preconcentration of Substances — I: Evaluation of Techniques (Project leaders: MIZUIKE and ZOLOTOV. Completion date: March 1977).
- (ii) Separation and Preconcentration of Trace Substances — II: High Purity Lead (Project leader: JACKWERTH. Completion date: March 1977).
- (iii) Recommended Methods for Pressure Decomposition (Project leaders: GOMIŠČEK and TÖLG. Completion date: March 1977).

6. Membership

Prof. MORRISON was nominated as new Chairman in place of Dr. KOCH, whose term as Chairman had ended at the Madrid meeting. As Titular Members were nominated for an additional 2 years: Prof. MORRISON (Chairman), Dr. PÍNTA (Secretary), Profs. CHENG and GOMIŠČEK; and as new Members Dr. M. GRASSERBAUER (Austria, former Associate Member) and Prof. G. TÖLG (FRG, currently Associate Member of Commission V.3). The Titular Member Dr. A. M. G. MACDONALD retired from the Commission. New Associate Members were nominated as follows: Prof. E. JACKWERTH (FRG), Dr. O. G. KOCH (FRG), Dr. P. LaFLEUR (USA), Dr. A. TOWNSHEND (UK) and Prof. YU. A. ZOLOTOV (USSR).

COMMISSION ON ANALYTICAL NOMENCLATURE (V.3)

3–6 September 1975

Present: Prof. H. M. N. H. IRVING (Chairman), Dr. H. ZETTLER (Secretary), Prof. H. FREISER, Prof. G. G. GUILBAULT, Dr. O. MENIS, Dr. N. M. RICE (Titular Members); Prof. H. KAISER (in part), Prof. O. SAMUELSON (Associate Members); Prof. N. TANAKA and Mr. R. W. FENNELL (Division President and Secretary) attended the meeting in parts.

1. Minutes of Previous Meeting

The minutes of the meeting held in London on 22 November 1974 [see *Inf. Bull.* Nos. 50/51 (November 1975), pages 108–112] were approved.

2. Compendium of Analytical Nomenclature

The project continued but had been slowed down by Prof. WEST'S move from Imperial College to the Macaulay Institute for Soil Research. In order to speed things up, and whether or not Prof. WEST was able to take part, the Working Party now consisted of Prof. IRVING, Prof. FREISER, Prof. WEST and, in addition, Dr. RICE. It was intended that material for publication should be ready by the next meeting of the Commission in London, 1976. Much initial work had been completed already on the index and introductory text.

3. Terms 'Equivalent' and 'Normal'

Prof. IRVING reported on the developments in the light of the comments received and on the further proposals arising out of the meeting of ISO/TC 47 in Moscow which he had attended as the IUPAC representative. He was preparing an entirely revised document which was to replace Provisional Nomenclature Appendix No. 36 (August 1974) to *Inf. Bull.*

4. Proposals Concerning Interdivisional Committee

A general report was given by Prof. IRVING. It was noted with satisfaction by the Commission that there was now no further intention to terminate the activities of Commission V.3.

5. Report on Status of Projects

(i) *Scales of Working.* Revision of the text is said to be complete but it has not yet been seen by members of the Commission.

- (ii) *Synonyms and Trivial Names*. This had been completed and published as Provisional Nomenclature Appendix No. 45 (September 1975) to *Inf. Bull*.
- (iii) *Molecular Absorption Spectrophotometry*. This document published as Provisional Nomenclature Appendix No. 44 (January 1975) to *Inf. Bull*. was under active revision in the light of critical comments received.
- (iv) *Precipitation Methods*. This report was being finalized.
- (v) *Ion-selective Procedures*. The draft report was being rewritten as a joint Project within Commission V.5.
- (vi) *Photoluminescence Procedures*. No progress was reported. It was hoped that this could be a joint Project with Commission V.4.
- (vii) *Liquid-Liquid Distribution*. The document was discussed in detail and a small number of critical comments were incorporated after discussion. The finalized document would now be submitted for publication in the usual way.
- (viii) *Kinetic Methods of Analysis*. Disappointingly slow progress was noted by the Commission. Extra effort was necessary to ensure a first draft for the November 1976 meeting in London.
- (ix) *Nomenclature of Ion-selective Electrodes*. It was agreed that a final revision of PNA No. 43, January 1975, should now appear as a definitive recommendation in *Pure Appl. Chem*.
- (x) *Selectivity Index*. This was a long-term project, and there was nothing further to report at the meeting. Concern was expressed whether the departure of Prof. WEST from academic life would have a delaying effect.
- (xi) *Sensitivity, Detection Limits, etc.* This project had been cancelled in view of the overlap with the project on Data Interpretation now in progress with Commission V.4.
- (xii) *Data Processing*. This project had been cancelled in view of the large number of other bodies currently engaged in the same or very similar fields.
- (xiii) *Compendium on Analytical Nomenclature*. See item 2. Arising out of the discussion it was explained, why up to that point, it had proved impossible for geographical reasons to involve Prof. FREISER in the preliminary work on the compendium.
- (xiv) *Photoluminescence Data*. No further progress was reported. The overlap with a similar project by Commission V.4 was resolved at a joint meeting (q.v.).
- (xv) *Nomenclature of Sampling*. The retirement of Dr. DOCHERTY made it essential to put extra effort into this project. Dr. RICE would now replace

him on the team which would be strengthened by one or more new Associate Members.

(xvi) *Nomenclature of Information Storage and Retrieval*. The name of project was changed to indicate more clearly the projected scope.

6. ICTA-Nomenclature in Thermal Analysis

As already in the case of Part I of the ICTA nomenclature report the Commission decided after some discussion to accept parts II and III also and to request formal IUPAC approval for publication through appropriate channels.

7. Nomenclature of Exchanging Sorbents

IUPAC approval had been sought for a document prepared by Prof. O. HERING (German Democratic Republic). On account of the many necessary cross references to work published or in progress by other IUPAC Divisions (e.g. Organic, Inorganic, Macromolecular) and to other relevant publications the Commission decided that it was first necessary to instigate a feasibility study (see item 9) before committing itself to undertake the sponsorship of a definitive project.

8. Membership

The Commission resolved to recommend the following membership to the Division Committee (New Titular Members are indicated by asterisk and new Associate Members by dagger):

Chairman: Dr. H. ZETTLER (FRG) 1975–77; *Secretary:* Prof. G. G. GUILBAULT (USA) 1975–79; *Titular Members:* Prof. H. FREISER (USA), *Dr. G. F. KIRKBRIGHT (UK), Dr. O. MENIS (USA), Dr. N. M. RICE (UK), Prof. A. J. B. ROBERTSON (UK), *Dr. G. SVEHLA (UK); *Associate Members:* Prof. H. M. N. H. IRVING, Prof. T. S. WEST, Prof. W. FISCHER, Prof. G. TÖLG, †Prof. DYRSSEN, †Prof. L. B. ROGERS, †Prof. S. P. PERONE, †Dr. TOWNSHEND. *National Representative:* Prof. H. A. TAWFIK (Arab Republic of Egypt).

9. Future Programme

The Commission agreed to put forward to the Division Committee proposals for the following new projects:

- (i) Nomenclature of Terms Used in the Practice of Liquid-liquid Extraction (Prof. FREISER, Prof. DYRSSEN, Prof. IRVING).

- (ii) Nomenclature of Automated Analysis (Prof. GUILBAULT – joint project with Clinical Chemistry Division).
 - (iii) Nomenclature of Luminescence Spectroscopy (Dr. MENIS – joint project with V.4).
 - (iv) Nomenclature of Exchanging Sorbents (Dr. ZETTLER – Feasibility Study, see item 7).
- Documents on the presentation of Analytical Methods in the Literature.
- (v) Luminescence Spectroscopy (Dr. MENIS).
 - (vi) Liquid-liquid Extraction (Prof. IRVING).

10. Any other Business

The Commission held three joint meetings:

- (i) On 4 September 1975, with Commission V.4. Prof. H. KAISER was in the Chair. It was decided that a joint project on Luminescence Spectrometry should be handled by a task group comprising Prof. J. D. WINEFORDNER (V.4) and Dr. MENIS (V.3). The Division Committee would be asked for approval and further guidance.
- (ii) On 5 September 1975, with Commission V.5. Prof. R. G. BATES (and subsequently Prof. IRVING) was in the Chair. The V.5 Project 'Transfer of Solutes from One Solvent to the Other' (Provisional Nomenclature Appendix No. 34 to *Inf. Bull.*) was discussed. The V.3 Project 'Nomenclature of Ion-selective Electrodes' (Provisional Nomenclature Appendix No. 43 to *Inf. Bull.*) was discussed on the basis of a revised draft by Prof. GUILBAULT. The V.3 Project 'Ion-selective Procedures' could not be discussed on account of shortage of time.
- (iii) On 5 September 1975, with the Commission on Automation (Clinical Chemistry Section), Prof. WHITEHEAD in the Chair. A revised draft on 'Characteristics of instruments intended for automated analysis in Clinical Chemistry' was laid on the table and Prof. WHITEHEAD explained in detail its purpose and the type of people whom it was hoped to influence in the provision of better instruments for clinical chemists.

While now appreciating the intentions behind the draft, members of V.3 were still critical of its content and remained unconvinced that, in its present form, it would have the desired and desirable impact.

11. Date and Place of Next Meeting

The next meeting of the Commission was planned for November 1976, most probably at the Royal Society, London.

COMMISSION ON SPECTROCHEMICAL AND OTHER OPTICAL PROCEDURES FOR ANALYSIS (V.4)

3–6 September 1975

Present: Prof. V. A. FASSEL (Chairman), Mr. B. F. SCRIBNER (Secretary), Prof. C. Th. J. ALKEMADE, Mr. L. S. BIRKS, Dr. E. PLŠKO, Prof. J. P. ROBIN (Titular Members); Prof. H. KAISER, Dr. R. MÜLLER, Dr. A. STRASHEIM (Associate Members); Mr. S. H. KANDIL (Egyptian Delegation – Observer).

1. Minutes of Previous Meetings

The minutes of the meeting at Munich during 22–25 August 1973 had been published in *Comptes Rendus XXVII Conference – Part B* (see pages 193–194). The minutes of an interim meeting, held in Washington, DC during 2–4 September 1974, had been published in *Inf. Bull.* No. 49, March 1975 (see pages 58–59).

2. Completed Projects

(i) The second nomenclature document, 'Nomenclature, Symbols, Units and Their Usage in Spectrochemical Analysis – II. Data Interpretation', had been circulated earlier as Appendix 26 (November 1972) to *Inf. Bull.* As a result of further consideration by the Commission the document had been greatly condensed. The changes made during the recent 18 months resulted in a document of greater scientific and linguistic precision. After submission of this revision to the Division, some further changes were suggested, particularly by Prof. HUME, Prof. SAMUELSON, Mr. FENNELL, and Dr. KOCH. These suggestions were reviewed at this Conference and generally were found to be appropriate. The pertinent suggestions were included in the final revision of the document which was returned to the Division Secretary before the end of the Conference. Part II was now considered to be ready for publication as a definitive document.

(ii) The third nomenclature document, subtitled 'Part III – Analytical Flame Spectroscopy and Associated Procedures', had been approved for publication by Council. Minor linguistic changes were made by the Commission during the past year. The Commission had requested that publication of Part III be made simultaneously with Part II, then nearing completion. Both documents were now ready for publication in the IUPAC journal *Pure and Applied Chemistry*.

(iii) The first in this series of nomenclature documents, 'Part I. General Atomic Emission Spectroscopy', which had been published in *Pure Appl. Chem.* **30**, Nos. 3–4, 653–679 (1972), had received favourable comments. The distribution of the document to those in spectroscopic fields had been greatly assisted through republication by the Society for Applied Spectroscopy in its journal, *Applied Spectroscopy*, **28**, No. 4, 398–410 (1974).

3. Continuing Projects

(i) The fourth in the series of nomenclature documents, 'Part IV. Analytical X-ray Spectroscopy', had been thoroughly reviewed at the interim meeting of the Commission in 1974. Further reviews during the past year by Commission members and outside experts resulted in the fourth draft which was examined page by page at this conference. The final draft, incorporating the latest changes, would be circulated to the Commission and then Division for approval for publication as a Provisional Nomenclature Appendix to *Inf. Bull.*

(ii) The fifth document in the nomenclature series is entitled 'Part V. Systematic Classification and Description of Spectrochemical Radiation Sources'. The fourth version of this document was prepared by the task group under Dr. PLŠKO and circulated within the Commission in August 1975. Simultaneously Dr. STRASHEIM and colleagues prepared another version which incorporated an extensive classification system for radiation sources. The two drafts were intensively reviewed by the Commission at this conference and the principal features were combined to strengthen the report. A new version was being prepared by the task group which planned a meeting in Grenoble on 15–19 September 1975. The forthcoming document Part V promised to be a valuable contribution to systematic classification and definitions of terms in this highly complex field of radiation sources. Completion was planned by the time of the conference in 1977.

(iii) Preparation of an index to terms in the Commission V.4 nomenclature documents had been undertaken by A. STRASHEIM and assistants. A draft of the Index prepared for Parts I, II, and III was available for this conference and it proved useful in locating terms during the discussions of current documents. The Commission proposed to submit the Index for publication with documents II and III. The Index would be expanded to include references to other documents in the nomenclature series as these were published.

4. New Projects

(i) The Commission proposed four new projects:

- (a) Nomenclature, Symbols, Units and their Usage in Spectrochemical Analysis. Part VI. Analytical Molecular Luminescence Spectroscopy (Project leader: Prof. J. WINEFORDNER).
 - (b) Part VII. Analytical Molecular Absorption Spectroscopy (Project leader to be selected).
 - (c) Preparation of Index for Parts I through VII (Project leader: A. STRASHEIM).
 - (d) Translation of Parts I through VII into French, German, and Russian. (This project would involve all members of Commission V.4.)
- (ii) Projects on Parts VI and VII had been proposed at the Munich meeting but Division approval had not been given at that time because of an apparent conflict with proposed projects of Commission V.3. As the result of a joint meeting of Commissions V.3 and V.4, the conflict was resolved with an agreement for cooperation between the two Commissions for a joint task group on luminescence to be headed by Prof. J. WINEFORDNER.
- (iii) The third project was an extension of the index already prepared for nomenclature documents I, II, and III.
- (iv) The fourth project to provide translations of the nomenclature documents, had for its goal a greater international dissemination of the information contained in the documents.

5. Liaison with Other Commissions

A joint meeting was held on 4 September 1975 with Commission V.3 primarily to resolve the apparent conflict on proposed work on nomenclature in luminescence spectroscopy.

Present: Prof. ALKEMADE (V.4), Mr. BIRKS (V.4), Prof. FASSEL (V.4), Prof. FREISER (V.3), Prof. GUILBAULT (V.3), Prof. IRVING (V.3), Dr. MENIS (V.3), Dr. MÜLLER (V.4), Dr. PLŠKO (V.4), Dr. RICE (V.3), Prof. ROBIN (V.4), Mr. SCRIBNER (V.4), and Dr. STRASHEIM (V.4). Also present were Mr. FENNELL, Prof. KAISER, Dr. WHITE (V.7), and Prof. TANAKA (Division President) and Mr. KANDIL (Guest).

(i) At the suggestion of Prof. IRVING, Prof. KAISER chaired the session. The possibility of overlap of projects on luminescence by Commissions V.3 and V.4 was discussed. A suggestion that a joint task group be established by the two Commissions for this work was proposed and accepted by the meeting. Prof. WINEFORDNER (V.4) and Dr. MENIS (V.3) were named to represent the two Commissions on the task group. The decision as to where the primary

responsibility would reside was left to the Division Committee (which later agreed with the proposal that the specialty commission, namely V.4, should have the primary responsibility and leadership). It was pointed out in discussion that Commission V.3 should have the responsibility to review all nomenclature documents developed in the Division and work in cooperation with the specialty Commissions to ensure general agreement with IUPAC policies and terminology.

(ii) A joint meeting was held with the Commission on Quantities and Units (CQUCC) of the Section on Clinical Chemistry (CCS) on 4 September 1975. Present were members of Commissions CQUCC, I.1, I.5, and V.4. The meeting was held to discuss the report on 'Optical Spectroscopy. Part 1 – General Kinds of Quantity' which had been prepared by CQUCC and circulated earlier this year. Criticism of the report was reviewed and further revision was considered necessary. The meeting recommended that a joint task group be established to revise the report. The recommendation was concurred in by Commission V.4 which agreed to appoint a representative to the task group.

6. Relations with Other Groups

(i) Documents prepared by other international groups had been referred to Commission V.4 for review. At this Conference the Commission considered the question of appropriate action to be taken on these documents, especially to avoid delays and overextension of the current Commission workload. The following guidelines were agreed upon: (a) the title (and text) of the document should be examined to ensure that it stated clearly the specific limited field of application to which it applies. Care should be taken to avoid the presumption of broad field coverage when this was not intended; (b) if the document did not agree with IUPAC and other recognized terminology, the preparing group should be informed of the appropriate documents; (c) continued efforts should be made by the Secretariat to have all present and future IUPAC documents transmitted to other international groups working in IUPAC related areas.

(ii) The proposed combination of the meetings of the Colloquium Spectroscopicum Internationale and the International Conference on Atomic Spectroscopy was discussed. The Commission indicated that it was pleased to observe the move toward combination of the two meeting groups and expressed its support of the action.

(iii) For the record it was noted that Mr. L. S. BIRKS had been appointed by Sir HAROLD THOMPSON to represent IUPAC to the Colloquium Spectroscop-

picum Internationale at its meeting on 15–19 September 1975 in Grenoble, France.

7. Membership

(i) At the beginning of the Commission V.4 meeting, Chairman FASSEL spoke of the loss to the Commission by the death in May 1974 of Titular Member Dr. A. C. MENZIES. Dr. MENZIES had contributed greatly to the work of the Commission, having served as Chairman/Titular Member (1959–65), as Associate Member until 1969, and had entered a second period as Titular Member in 1969. In remembrance of Dr. MENZIES, a period of silence was observed by the Commission before proceeding with the first session.

(ii) The following retired as Titular Members in Madrid: Prof. FASSELL, Mr. SCRIBNER, and Prof. ALKEMADE. The Commission nominated Mr. BIRKS as Chairman and Prof. WINEFORDNER as Secretary. Others nominated to continue as Titular Members were Prof. ROBIN, for a second 4-year term, and Dr. PLŠKO for a 2-year extension. Dr. MÜLLER and Dr. STRASHEIM (serving currently as Associate Members) were nominated to be Titular Members as were Dr. K. LAQUA (Federal Republic of Germany) and Dr. W. H. MELHUISE (New Zealand).

(iii) Dr. JENKINS, Prof. KAISER, and Dr. RUBEŠKA were to continue as Associate Members. Prof. ALKEMADE and Prof. FASSEL were nominated to serve as Associate Members together with Dr. YU. I. BELYAEV (USSR) and Dr. M. ZANDER (Federal Republic of Germany). One additional Associate Member would be chosen after solicitation of willingness to serve.

(iv) The nomination of Dr. PLŠKO to serve a term of 2 years as Titular Member beyond his current 8 years constitutes an exception to the rules. The Commission agreed to request special permission for Dr. PLŠKO to continue as a Titular Member in order that the essential work for which he was project leader might be brought to completion. Dr. PLŠKO was directing the preparation of a definitive document, number V in our nomenclature series, entitled 'Systematic Classification and Description of Spectrochemical Radiation Sources'. In view of the progress made to date, the Commission felt that the document could be essentially completed within 2 years under the leadership of Dr. PLŠKO.

COMMISSION ON ELECTROANALYTICAL CHEMISTRY (V.5)

3–6 September 1975

Present: Prof. R. G. BATES (Chairman), Prof. J. F. COETZEE (Secretary), Prof. E. BISHOP, Prof. T. FUJINAGA, Prof. Z. GALUS, Prof. L. MEITES, Prof. H. W. NÜRNBERG, Prof. P. ZUMAN (Titular Members); Prof. J. JORDAN, Prof. E. PUNGOR (Associate Members); Prof. N. TANAKA, Dr. P. O. KANE (National Representatives).

1. Minutes of Previous Meetings

The minutes of the meeting in Munich, during 22–25 August 1973 and of the special meeting (limited Members participating) in Jülich during 22–24 July 1974 were approved.

2. Reports

Two reports had been published in final form: 'An Approach to Conventional Scales of Ionic Activity for the Standardization of Ion-selective Electrodes' [BATES and ROBINSON, *Pure Appl. Chem.*, **37**, 573(1974)], and 'N-Methylpropionamide as an Electrolytic Solvent' [HOOVER, *Pure Appl. Chem.*, **37**, 579(1974)]. Four reports had been published in preliminary form as Provisional Nomenclature Appendices (PNAs) to *Inf. Bull.*: 'Classification and Nomenclature of Electroanalytical Techniques' (MEITES, NÜRNBERG, ZUMAN, PNA No. 30, August 1973); 'Proposed Terminology and Symbol for the Transfer of Solutes from One Solvent to Another' (COETZEE, TRÉMILLON, PNA No. 34, August 1974); 'Status of the Faraday Constant as an Analytical Standard' (BISHOP, PNA No. 35, August 1974); and 'Recommendations for Sign Conventions and Plotting of Electrochemical Data' (JORDAN, MEITES, PNA No. 42, January 1975). Comments received on these preliminary reports were considered at the Madrid meeting and the revised reports had been submitted to Council for final approval. Three other reports had been approved by the Commission and submitted to the Division Committee for approval: 'Hexamethylphosphoramide: Purification and Tests for Purity' (FUJINAGA); 'Sulpholane: Purification and Tests for Impurities' (COETZEE); and 'Voltammetric Half-wave Potentials in Sulpholane as Solvent' (COETZEE).

3. Continuing Projects

In addition to the production of formal reports, an important continuing

activity of the Commission was the generation of Position papers on topics of unusually broad scope. In these, the general status of the field was outlined, specific problematical features of the field were indicated, and the desirability and feasibility of producing a complete report were assessed. Among the continuing projects listed below, those leading to Position papers are so identified.

(i) 'N, N'-Dimethylformamide. Purification and Tests for Impurities' (JUILLARD). A preliminary report was considered in Madrid and a number of changes were recommended.

(ii) 'Purification of Non-Aqueous Solvents and Tests for Impurities.' The above report on DMF was the last in a series of nine produced since 1966 by the Commission. Authors of these reports, particularly of the earlier ones, would be requested (project leader: COETZEE) to revise their reports, which would then be submitted for publication under one cover.

(iii) 'Half-wave Potentials in Hexamethylphosphoramide' (FUJINAGA). Preliminary report was presented in Madrid.

(iv) 'Half-wave Potentials in Propylene Carbonate' (FUJINAGA). This Report was in preparation.

(v) 'Half-wave Potentials of Inorganic Substances in N, N'-Dimethylformamide'(COETZEE). Preliminary report was presented in Madrid.

(vi) 'Recommended Terms, Symbols and Definitions for Electroanalytical Chemistry'(MEITES,NÜRNBERG,ZUMAN,with BISHOP).Preliminary report was presented in Madrid and was discussed with Commissions I.3 and V.3.

(vii) 'Applications and Potentialities of Electroanalytical Techniques in Environmental Analysis' (NÜRNBERG). Preliminary report was presented in Madrid.

(viii) 'Thermodynamic and Kinetic Data for Carboxylic Acids at Higher Ionic Strengths' (NÜRNBERG). Position paper was presented in Madrid, and discussed with Commission V.6.

(ix) 'Selectivity of Ion-selective Electrodes' (PUNGOR). This Report was in preparation.

(x) 'Standard Potential of the Silver-Silver Chloride Electrode'(BATES). Preliminary report was presented in Madrid.

(xi) 'Conditional Diffusion Coefficients' (BISHOP, GALUS). Position paper was presented in Madrid; report was expected to be ready in 2 years.

(xii) 'Indicator Electrodes in Non-aqueous Solvents' (COETZEE, TRÉMILLON). Position paper was in preparation.

4. New Projects

The anticipated duration of the project is indicated in parentheses.

- (i) 'Application of Ion-selective Electrodes, Other than Those for Hydrogen Ion, in Non-aqueous Solvents' (IZUTSU). Position paper (2 years).
- (ii) 'Acid-base Dissociation Constants in Propylene Carbonate (IZUTSU). Discussed with Commission V.6. Report (2 years).
- (iii) 'Concise Summary of Electroanalytical Nomenclature' (JORDAN — in cooperation with MEITES, NÜRNBERG, ZUMAN) (1 year). Would be useful to authors and editors who might be reluctant to consult the detailed report produced by Commission V.5.
- (iv) 'Voltammetric Studies of Metal Complexes in Non-aqueous Solvents' (KAPOOR). Position paper (2 years).
- (v) 'Recommendations on Reporting of Electroanalytical Data' (MEITES — in cooperation with JORDAN, ZUMAN) (2 years). Would serve as a useful guide for authors and thereby improve the quality of manuscripts.
- (vi) 'Potentiometry and Voltammetry in Marine Chemistry' (BATES, NÜRNBERG, BRANICA) (2 years).
- (vii) 'Comparison of Electroanalytical Detectors with Other Detectors in Chromatography (PUNGOR) (1 year).
- (viii) 'Electroanalytical Chemistry of Intermetallic Compounds in Mercury' (GALUS) (2 years).
- (ix) 'Diffusion Coefficients in Mercury' (GALUS) (2 years).
- (x) 'Voltammetric Half-wave Potentials of Inorganic Substances in Acetonitrile (COETZEE) (2 years).
- (xi) 'Newsletter on Activities of Commission V.5. Four issues would be produced during the next 2 years (JORDAN — with BISHOP).

5. Liaison with Other Commissions

Joint meetings were held with Commissions V.3, V.6 and I.3. The following topics were discussed.

- (i) 'Terminology and Symbol for the Transfer of Solutes from One Solvent to Another'. The quantity concerned was termed the 'medium effect', symbol $\gamma_{s_2}^{s_1}$ (B), in 'Electrochemical Definitions and Symbols', an Appendix to 'Electrochemical Nomenclature' produced by Commission I.3. In discussions with Commissions V.3 and I.3 it was agreed that an acceptable alternative term would be the 'transfer activity coefficient', with the symbol given above,

or, alternatively, $\gamma_R^S(B)$, where R was a reference solvent and S was the other solvent concerned. Furthermore, once S_1 and S_2 (or S and R) had been specified, an acceptable contraction of the symbol would be γ_t .

(ii) 'Recommendations for Nomenclature of Ion-selective Electrodes'. This report, produced by an *ad hoc* committee under the chairmanship of Prof. G. G. GUILBAULT, was discussed with Commission V.3. Most of the discussion concerned classification of electrodes, selectivity functions and the proper specification of the detection limit in unbuffered solutions. Consensus was reached on these and all other points discussed.

(iii) 'Recommended Terms, Symbols and Definitions for Electroanalytical Chemistry'. A tentative version of this Appendix (MEITES, NÜRNBERG, ZUMAN) to the *Manual of Symbols and Terminology for Physicochemical Quantities and Units* was discussed with Commissions V.3 and I.3. It was requested that further comments be sent to Prof. MEITES by 15 November 1975.

(iv) Other Business with Commission V.6. Consensus was reached on how to avoid overlap between the activities of Commissions V.5 and V.6. The continuing project, number (viii), and the new project, number (ii), of Commission V.5 were approved by V.6. Another new project on 'Solubility of Metals in Mercury' would be a joint venture between GALUS (V.5) and V.6.

(v) Other Business with Commission I.3. The desirability of creating an Interdivisional Coordinating Committee with membership drawn from Commissions I.3 and V.5 would be discussed with the respective Division Committees.

6. Membership

Profs. BATES and COETZEE were nominated for second 4-year terms as Chairman and Secretary, respectively. Profs. FUJINAGA and NÜRNBERG were nominated for second 4-year terms as Titular Members. Prof. JORDAN (previously an Associate Member) was nominated as Titular Member. Profs. BRANICA, IZUTSU, PUNGOR and TRÉMILLON were nominated for additional 2-year terms as Associate Members. Three new Associate Members were nominated: Prof. O. A. SONGINA (USSR), Dr. A. K. COVINGTON (UK), and Prof. L. MEITES (USA, formerly a Titular Member). Finally, it was the intention of the Commission to nominate an eighth Associate Member by mail ballot.

COMMISSION ON EQUILIBRIUM DATA (V.6)

3–6 September 1975

Present: Prof. G. H. NANCOLLAS (Chairman), Dr. S. AHRLAND (Secretary), Prof. G. ANDEREGG, Dr. E. HÖGFELDT, Prof. A. S. KERTES, Dr. D. D. PERRIN, Dr. J. STARY (Titular Members); Prof. A. F. CLIFFORD, Prof. D. N. HUME, Prof. H. OHTAKI, Dr. C. L. YOUNG, Prof. YU. A. ZOLOTOV (Associate Members); Prof. S. S. DAVIS, Prof. I. ELIZER, Prof. W. GERRARD (Subcommission Members).

1. Chairman's Report

The Chairman reported on the various activities of the Commission since its last Meeting in Munich in September 1973 (for Minutes see *Comptes Rendus XXVII Conference – Part B*, pages 198–203). The progress of the different projects undertaken is described at the relevant points below.

An interim meeting had been held in Dublin on 20 August 1974, attended by seven members of the Commission. The Chairman and the Secretary had met with Dr. HÖGFELDT in Berlin in March 1975.

2. Solubility Data

Prof. KERTES reported on the extensive activities conducted within the frame of the Solubility Data Project (Subcommission V.6.1), in order to get this vast undertaking going. For an account of these activities see the separate minutes issued by the Subcommission which are published in the pages that follow. The Commission expressed its appreciation of the great efforts put into this project by Prof. KERTES and his collaborators.

3. Stability Constants

The second Supplement, covering the time 1968–73, is expected to be ready for publication by mid-1976. The tables of inorganic ligands, edited by Dr. HÖGFELDT, would cover about 400 manuscript pages, those of organic ligands, edited by Dr. PERRIN, about 1500 pages. The number of pages might, by suitable technical rearrangement, be sizeably reduced at the final typing, however, which is indeed desirable in order to reduce the cost. It seemed suitable to publish the inorganic and the organic sections in separate volumes in order to leave the user free to buy that part of the compilation that he really wanted.

Offset printing was necessary, in the first hand in order to reduce the cost which would be excessive for typesetting of tables like the present ones. Also the work involved in proof-reading, correcting, etc., would be much reduced. Furthermore, the number of typographical errors would be much less.

Offset printing demanded a perfect typescript and in order to achieve this, the typescript must be prepared under the immediate supervision of the chief compilers. Considering the easing of the load and responsibilities borne by the publisher with such an arrangement, the publisher should bear the cost of the preparation of the final typescript. This had also become an established custom. For the present supplement no further expenses were foreseen. As this project was a continuing one, however, the future compilation work had to be supported. It seemed reasonable to set aside for this purpose part of the royalties earned by the volumes.

The publishing might either be handled by the Chemical Society, publisher of the original volume and the first supplement, or by IUPAC's new publisher, Pergamon Press. If the Chemical Society could not undertake to publish the second supplement in an offset edition, to reprint the first two volumes as they go out of print (not satisfactory to have these available only in the form of microfiche), to pay for the final typing of the second supplement and to pay a reasonable royalty, to be used for the compilation of further supplements, they should not continue as publishers of this series. The copyright of the first two volumes should then revert to IUPAC, and the series handled by their new publisher. These views would be brought before the Division and Publication Committees.

The Commission expressed their great appreciation of the tremendous work put into these extremely useful compilations by Drs. HÖGFELDT and PERRIN, and their coworkers all over the world.

4. Data Flagging

Prof. HUME presented the fourth improved version of data flags. It was reported that in an open meeting opposition had been encountered from Mr. J. C. RIGG and Prof. E. F. WESTRUM who preferred a more elaborate system of data tagging. The majority felt, however, that the data flags should be tried out for a year in some journals and the results then evaluated. Prof. HUME was endorsed to ask the Bureau for permission to do so.

5. Critical Surveys

A status report had been received from Prof. BECK who was not himself

present at the Meeting. The project was now well under way, with four surveys either ready for publication or in an advanced state of preparation. Authors had been found for two more. The introductory chapter should be slightly revised, in view of reviewers' comments, and then again sent to the Division Committee. The procedure for the reviewing of the surveys by Members of the Commission was formalized as follows:

When a Survey was nearing completion, the Project Leader should inform all Commission Members about the forthcoming Survey, asking them whether they were prepared to act as Referees. It should be pointed out that it was very desirable that several Members do act as Referees. The Project Leader should secure at least two Referees for each Survey. The comments of the Referees should be sent to the Project Leader with copies to the Commission Chairman. The final version should then be prepared and sent to the Commission Chairman for final approval. It would then be forwarded by him to the IUPAC Secretariat.

It was further decided that the Critical Surveys dealing with liquid-liquid distribution equilibria should form a separate series, with Prof. KERTES as editor.

The Chairman would inform Prof. BECK about these decisions, and also convey to him the Commission's congratulations on the good progress of the project.

6. Dissociation Constants of Organic Acids and Bases

Dr. PERRIN reported that the compilation of dissociation constants of organic acids would be ready for publication by the end of 1976. The compilation of dissociation constants of organic bases, published 1965, with supplement 1972, would not be reprinted by Butterworths. To ensure its continued availability, a similar procedure ought to be adopted as outlined above for 'Stability Constants'.

7. Nomenclature and Symbols for Mixed Ligand Equilibria

The report presented by Profs. HUME and NANCOLLAS was adopted in principle. A minor modification was asked for, in order to include the β_{ijkl} notation. This should be done before end of October 1975.

8. Equilibrium Constants of Liquid-Liquid Distribution Reactions

Prof. KERTES reported that the series was by now completed. Four volumes had been compiled. Of these, (i) *Organophosphorus Extractants*, by

MARCUS, KERTES, and YANIR and (ii) *Alkylammonium Salt Extractants*, by KERTES, MARCUS, and YANIR, were both in print, while (iii) *Compound Forming Extractants, Solvating Solvents and Inert Solvents*, by MARCUS, YANIR, and KERTES, and (iv) *Chelating Extractants*, by STARY and FREISER, had been approved by the Commission and forwarded for publication.

9. International Committee on Solvent Extraction Chemistry and Technology (ICSECAT)

Prof. KERTES announced the formation of this new international body, expressing the hope that the Commission would support requests of IUPAC sponsorship for the meetings of the Committee.

10. New Project: Guidelines for the Determination of Stability Constants

Many instances were found in the literature of ill-defined experimental conditions. The data published were under such circumstances of limited value, but were still uncritically used by workers not familiar with the field. A real need therefore existed for guidelines stating the necessary conditions for reliable measurement. Prof. NANCOLLAS undertook the task of writing such guidelines.

11. Proposals for New Projects

- (i) Critical survey of sea water equilibria involving metal ions. Position paper to be written by Prof. AHRLAND before end of 1975.
- (ii) Critical survey of metal complex equilibria of biological interest. Position paper to be written by Prof. ANDEREGG before end of 1975.
- (iii) Critical Survey of redox equilibria. Position paper to be written by Prof. CLIFFORD before end of 1975.

Prof. H. FREISER resigned his Titular Membership for the two remaining years of his period, 1975–77. In his place Prof. M. T. BECK was elected Titular Member. Prof. NANCOLLAS, Drs. HÖGFELDT, PERRIN, and STARY were re-elected Titular Members for the period 1975–79.

Profs. CLIFFORD, HUME, MARCUS, OHTAKI and Dr. YOUNG were re-elected Associate Members for the period 1975–77. Prof. ZOLOTOV resigned as Associate Member. Profs. FREISER and R. BATTINO were elected new Associate Members. One vacancy still remaining would be filled

later on, pending proposals of new projects.

Prof. YATZIMIRSKII resigned as National Representative of USSR. In his place Prof. I. N. MAROV was admitted.

The Commission expressed their thanks to Profs. ZOLOTOV and YATZIMIRSKII for their participation in the work of the Commission.

In the Subcommittee on Solubility Data, Profs. KERTES, CLIFFORD, NANCOLLAS and Drs. SIGWORTH and YOUNG were re-elected for the period 1975-77. Prof. R. BATTINO, Dr. H. F. M. BARTON, Prof. H. L. CLEVER, Dr. E. A. DANCY, Profs. S. S. DAVIS, I. ELIEZER, W. GERRARD and P. HUYSKENS were elected new Members of the Subcommittee. In the Subcommittee on Compilation of Stability Constants Data for Metal Complexes in Solution all the present Members were re-elected for the period 1975-77.

SUBCOMMISSION ON SOLUBILITY DATA (V.6.1)

2, 3 and 6 September 1975

Present: Prof. A. S. KERTES (Chairman), Prof. A. F. CLIFFORD, Prof. G. H. NANCOLLAS, Dr. C. L. YOUNG (Members); Dr. H. L. CLEVER, Prof. S. S. DAVIS, Dr. W. GERRARD (Observers); Prof. I. ELIEZER (CODATA Representative); Dr. J. CASQUET (CODATA—IUGG Representative).

1. Chairman's Report

This report was delivered at the joint meeting of Commission V.6 and Subcommission V.6.1 on 3 September 1975.

Since this was the first joint meeting of the Subcommission with its parent Commission, Prof. KERTES described the Subcommission's activities since its establishment at the XXVIIth IUPAC Conference in Munich, August 1973. In more detail were described the activities during the last year, since the Subcommission meeting in Montreal, June 1974.

2. CODATA Task Group

It became apparent during the year that the CODATA Task Group on Solubility Data as initially conceived could not be properly in operation for a number of reasons. Though the participating Unions were interested in taking an active role in the project, difficulties were encountered, within the Unions, to locate the right persons to be named to the Task Group. Correspondence was slow and frequently inefficient. The general lack of funds; and the difference in opinion on who had to finance the participation of the Union-delegates in the meetings of the Task Group, CODATA or the participating Unions, had been additional factors responsible for the failure of the Task Group. At this meeting only the representative of the International Union of Geodesy and Geophysics (Dr. CASQUET) was present, in addition to Dr. ELIEZER, Chairman of the *ad hoc* Task Group.

As these difficulties became apparent in the early spring of 1975, it also became clear that the mechanism of CODATA's participation in the project needed a revision. Prof. KERTES had met in Brussels in March 1975 with Prof. MELCHIOR, President of CODATA, and in Paris with Dr. DREYFUS, Executive Secretary of CODATA, and had a long telephone conversation with Prof. KURTI, Treasurer of CODATA, and both he and Dr. ELIEZER explored the situation in detail with Prof. WESTRUM, Secretary General of CODATA, in Jerusalem in July 1975. Based on these discussions the

following possibility of reorganization of the CODATA–IUPAC cooperation in the Solubility Data Project emerged.

The CODATA *ad hoc* Task Group should terminate its work and be dissolved. The scientific cooperation between Unions other than IUPAC and the Solubility Data Project should be established via direct personal contacts. Participating Unions would be requested to appoint one or more liaison scientists who would be in direct contact with the appropriate Topic Editors for scientific consultations. This mechanism of cooperation was of the individual type, done essentially by correspondence, with no committee work involved. Two examples could be given: The Association Internationale de Volcanologie et de Chimie de l'Interieur de la Terre (IAVCEI of IUGG) should appoint two liaison scientists, one to the Topic Editor of the Solubility Data Project in charge of the topic 'Solubility of gases in molten salts, glasses and slags', and another to the Topic Editor in charge of the topic 'Solubility of solids in molten salts, glasses and slags'. Or, another example, both the International Association of Hydrological Sciences and the International Association of Physical Sciences of Oceans should appoint each a liaison scientist to the Topic Editor in charge of 'Solubility of gases in sea water'.

The problem of locating the right persons to serve as liaison scientists within the participating Unions had yet to be solved. The experience of the last 2 years, while not encouraging, should not be taken as evidence that such persons cannot be found through a more intense and vigorous search. The possibility should be considered that CODATA Secretariat take up that responsibility. It was in these terms that Drs. ELIEZER and KERTES would report to CODATA.

3. Guidelines for Compilers/Evaluators

Since the Montreal meeting significant progress had been made in the preparation of guidelines for gas/liquid and liquid/liquid solubility systems, but none could be noted for the solid/liquid system.

(i) *Gas/Liquid Systems*. In accordance with the decision taken in Montreal, Dr. YOUNG had prepared the penultimate version of the guides for compilers/evaluators of solubility data in these systems. The document had been disseminated among those associated with the project, and further discussed by the Subcommission and, in more detail, by a Working Party consisting of Drs. CLEVER, DAVIS, GERRARD, and YOUNG at the present meeting. This version of the guidelines had been found satisfactory, except for some technical points such as the method of expressing solubilities in mole fractions

rather than mole ratios, and to adopt pascal as the pressure unit as far as possible. It had been decided that the guidelines could now be written in a final form with only minor changes. Dr. YOUNG would prepare the final version of the general guidelines.

A draft of supplemental guides for high-temperature metallurgical systems of gas solubilities in molten metals and alloys had been prepared by Dr. SIGWORTH in July 1975. The draft had been disseminated among Members of the Subcommittee and a number of scientists knowledgeable in the field, and comments requested. A revised draft would have to be approved by correspondence.

(ii) *Liquid/Liquid Systems*. During the last year, the Subcommittee had been successful in engaging the active cooperation of Drs. BARTON and DAVIS. Independently, each had prepared a draft of guidelines for compilation and evaluation of solubility data in liquid-liquid systems, which were circulated for comments. Based on consultation by mail between the authors and the comments received, a combined draft of the guidelines had been prepared in July 1975 and circulated prior to this meeting. That version, and the example system of water-butanone given in it, had been discussed in detail, and Prof. DAVIS had agreed to revise the guidelines considering the written comments received from colleagues and the suggestions made at this meeting. It was understood that Prof. DAVIS would disseminate the revised version before the end of the year, hoping that the responsibilities of his new academic position (Head, Department of Pharmacy, University of Nottingham) would not impose on him too heavily.

A first draft of supplemental guides by Prof. HUYSKENS for liquid-liquid solubility systems in which interaction between the components affected their mutual solubilities, had been circulated shortly before this meeting. Colleagues were asked to comment on this draft by writing to the author as soon as possible. A brief memorandum concerning similar liquid-liquid solubility systems, authored by Prof. VIALARD, was submitted to the Subcommittee at this meeting. It had been decided to ask Profs. HUYSKENS and VIALARD to establish a direct contact and to revise jointly the supplemental guides relying on the general guidelines for liquid-liquid solubility systems (see also Topic Editors).

(iii) *Solid/Liquid Systems*. Following the meeting in Montreal, Drs. CLIFFORD and SCHINDLER met in Bern in September 1974 in order to resolve the differences in opinion as to how much auxiliary information on equilibrium constants of reactions affecting solubility of inorganic compounds and

relevant thermodynamic data should be included. An outline of the main points to be elaborated on in the guidelines had been jointly formulated, and Dr. SCHINDLER agreed to draft the general guidelines by early 1975. For reasons unknown, Dr. SCHINDLER had not produced the draft, and CLIFFORD and KERTES had been charged to reestablish contact with him. In May 1975, Dr. ELIEZER had agreed to prepare an independent draft of Guidelines to be ready before the Madrid meeting. Unfortunately, he was unable to meet his commitment. As consequence of these two unfulfilled obligations no draft of guidelines was presently available for compilation and evaluation of solid-liquid solubility data.

A discussion following that part of Prof. KERTES's report centred on the question whether, in view of the situation, Profs. CLIFFORD and ELIEZER should jointly produce one version of guidelines, or, alternatively, to proceed along the established mechanism of drafting independently, each his own, version of guidelines for solid/liquid solubility systems. The latter mechanism, which had been used in the preparation of existing guidelines for gas/liquid and liquid/liquid solubility systems, had a number of advantages, and it had been resolved to ask Profs. CLIFFORD and ELIEZER to prepare their drafts independently and to circulate them separately before the year's end. A revised unified version, based on the comments received, should be ready for approval by the spring of 1976.

Since last fall, Dr. DANCY had been exploring the feasibility of including into the project the topic of solubilities of solids in molten salts, glasses and slags. She had prepared a Position paper on her findings which had been circulated among some Members of the Subcommission. Presently, she was engaged in sorting out the possible overlap of systems to be included in her topic with those covered by the ongoing project of phase diagrams of the American Ceramic Society. Because of her regretful absence from the meeting, only a brief discussion followed this part of the Chairman's report, and it had been decided to ask Dr. DANCY to prepare a working paper containing an outline of her topic to be disseminated for comments, and to be discussed at the forthcoming meeting of the Subcommission.

4. Official Status of Subcommission Documents

At its meeting on 4 September Commission V.6 had discussed in considerable detail the official status of guides and instructions for compilation, evaluation and critical surveys produced by Members of the Commission and its two Subcommissions. The implications of the decisions taken by the Commission

concerning the guidelines and supplementary guides for compilation and evaluation of solubility data, instructions to Topic Editors, and other similar documents to be produced by the Subcommission in the future, had been discussed at the 6 September joint session. The consensus was that the above documents could not and should not be regarded as official, IUPAC endorsed, documents. They were intended for internal use, disseminated in a limited number of copies, and actually used only by compilers and evaluators in their work. Though of a significant scientific value for the very purpose they had been produced, these documents, at least in their present form (but see Recommendations for Publication of Solubility Data in the Primary Literature), had neither intrinsic value nor were they of a general usefulness.

It had thus been resolved that copies of these documents should be disseminated among all Members of the parent Commission, in addition, of course, to the Members of the Subcommission, for their information and possible comments. However, no formal recommendation for endorsement would be requested. The Chairman had been charged to check with the Division Officers, and if needed, with the Executive Secretary, whether this decision was in line with IUPAC regulations and practice.

5. Topic Editors

The Chairman's report on the existing definition of topics as established in Montreal, and the discussion that followed were intervened by the report and discussions on the guidelines for compilers/evaluators minuted under that heading.

(i) *Gas/Liquid Systems*. The Subcommission at its meeting in Montreal appointed Drs. CLEVER, SIGWORTH, and YOUNG as Topic Editors for topics. The question arose whether the existing definition and subdivision into topics was still realistic and practical, and whether a revised subdivision of gas/liquid systems might be in place in order to speed up the scientific work. A Working Party, consisting of Drs. CLEVER, DAVIS, GERRARD, and YOUNG had been appointed to look into the matter further during this meeting, and Dr. CLEVER would subsequently submit a proposal if changes were desirable. It was clear, however, that at least two, but perhaps more, additional Topic Editors would be needed to handle systems of gas solubilities in sea water, biological fluids, and molten salts and ceramic systems. Prof. KERTES had been charged with continuing his efforts to find experts in these fields willing to join the project.

Dr. SIGWORTH had requested the permission to be assisted in his

recruiting and/or editorial work by a colleague (unnamed) of his choice. Because of the regretful absence of Dr. SIGWORTH, the Subcommission was in no position to define the status of that colleague at the present time, but had agreed to grant the permission requested, at least until it could discuss the matter more fully at its forthcoming meeting.

(ii) *Liquid/Liquid Systems*. The subdivision of these systems as it appeared in the DAVIS-BARTON draft of the guidelines called for an impractically large number of Topic Editors. Several alternative subdivisions were discussed at considerable length but no firm scheme had been decided upon. The consensus was that the above classification be combined in such a way that three to five Topic Editors were needed to be in charge of all liquid/liquid solubility systems.

It had been noted that the Subcommission could probably count on two (Drs. BARTON and DAVIS) but perhaps three (Dr. McLURE in addition) Members to accept the responsibility of Topic Editor in systems of non-reacting liquids, and on another two Members (Profs. HUYSKENS and VIALARD) for systems in which specific interactions govern the extent of mutual liquid solubilities.

The discussion ended with Prof. DAVIS agreeing to propose a revised scheme of liquid-liquid solubility systems so that the whole field could be handled by a relatively small number of Topic Editors. The scheme would include also the assignment of the Editors, after his consultation with the colleagues involved.

(iii) *Solid/Liquid Systems*. At an earlier stage, Prof. CLIFFORD had proposed a tentative subdivision for these systems. A new scheme, revised in the spirit of the consensus voiced in the discussions on other systems, would be incorporated in the draft of the guidelines he had proposed to prepare. Prof. ELIEZER had noted that his draft should equally include a scheme of subdivision into topics.

6. Instructions to Topic Editors

Following the Montreal meeting, Prof. BATTINO had agreed to draft a guide entitled 'Instructions to Topic Editors' which would precisely spell out the line of action and the responsibilities of Topic Editors. After repeated consultations with several colleagues, he had circulated the draft of the Instructions in February 1975 and invited comments. Because of the uncertainties with the publisher, thus the lack of possibility to define several important aspects connected with the publishing procedure and the financing of the work, the

document could not be finalized.

It was now hoped that the ongoing negotiations concerning the publication would soon be terminated, enabling thus Prof. BATTINO to update the Instructions accordingly.

7. Coding System

For a variety of reasons, such as computerization of numerical data, publication of revisions and supplements, and cross referencing the data sheets, it appeared desirable to develop a self-consistent coding system for data sheets. During the last year, Prof. BATTINO had given much thought to the problem and devised several coding possibilities. The last draft was circulated in April 1975. In addition, Prof. CLIFFORD had produced a tentative coding scheme for inorganic systems.

At the Madrid meeting, a Working Party consisting of Drs. CLEVER, CLIFFORD, and ELIEZER discussed further the status of the existing drafts. Their position paper, subsequently presented to the Subcommission, recommended that a careful reconsideration might be in place in order to determine the possible advantages of using codes over chemical formulas. Should the Subcommission decide that coding was necessary, the Working Party suggested that the problem should be studied in much greater detail by consulting outside experts in the field.

Because of the regretful absence of Prof. BATTINO, it was decided to ask him to consider these recommendations and to take position.

8. Example Booklet

In contact with bodies and individuals, inside and outside of IUPAC, it became apparent that the magnitude and complexity of the project made it increasingly difficult for description without concrete examples of the type of output the project would generate. While this was especially true in contacts with non-chemists, quite a few chemists had difficulties conceiving the dimensions and multitude of systems the project planned to cover.

It had been thus decided earlier this year to produce an example or demonstration booklet (pamphlet) in order to further the project in a variety of respects. It is envisaged that the booklet would contain an introductory text outlining its philosophy, scope, mechanism of operation, and its subdivision in scientific and publication terms. It would contain four or five examples of Assignment Units, complete with data sheets, evaluation text, and tables and graphs of recommended numerical data. The booklet, in

addition to serving the above descriptive purpose, would be used to publicize the project and its output and would serve the subscription campaign. The introductory material would be printed as a preface in every and all volumes published.

Prof. BATTINO (subdivision of the project for publishing purposes, Dr. CLEVER (introductory text), Prof. CLIFFORD (solid-liquid assignment unit), Prof. DAVIS (liquid-liquid unit), Prof. GERRARD (gas-liquid unit), Prof. KERTES (general editing), Dr. SIGWORTH (metallurgical gas-liquid unit), and Dr. YOUNG (gas-liquid unit) had accepted to cooperate in the production of the material for the booklet, which should be ready for final editing before the end of 1975.

9. Publication

A significant change had taken place since the Montreal meeting in the publication aspects of the project. After almost 2 years of rather weary negotiations, no final agreement could be reached on the participation of Gmelin Institut in the Solubility Data Project. At a last attempt, made in March 1975 when Prof. KERTES met in Frankfurt with the representatives of Gmelin (Prof. BECKE and Dr. LIPPERT), Landolt-Bernstein (Profs. SCHAFFER and HELLWEGE), and Springer Verlag (Mr. SALLE), it became clear that there was no way to close the gap because of conflicting viewpoints on several fundamental issues. It was impossible for IUPAC to meet the financial and other requirements of the publishing group, thus Gmelin had to withdraw from the project. It was a regrettable event which caused a considerable delay in the consolidation of the publishing aspects of the project.

Released from obligations toward Gmelin, contacts were established with commercial publishers. Because of the commercial character of some of the issues under negotiation, no names and specifics could be reported at this stage. Complex negotiations with the participation of the Division President and Secretary, in addition to the Members of the Subcommission, and involving the Chairman of the IUPAC Committee on Publications and the IUPAC Treasurer, were conducted at this meeting. It was impossible to finalize the agreement, mostly because some important financial aspects needed further clarification. It was hoped, however, that the outstanding differences in opinion would be favourably resolved before the end of 1975, and Prof. KERTES had been charged with reporting on the agreement at a later date. It was noted that the arrangement under negotiation would contain provisions

for the publisher's participation in the expenses both of the compilation work and of the preparation of the manuscripts.

10. Financing

The present negotiations with the publisher include the request for financial contribution toward the expenses of the compilation work to be made by the publisher. Prof. KERTES had been charged with reporting on the final arrangements as soon as the agreement had been signed.

11. Computerization and Data Retrieval System

Various aspects of a computer-based production of data sheets and a computer-based information retrieval system for on-demand searches had been discussed extensively at the Montreal meeting in 1974. As charged by the Subcommission, Prof. KERTES met in October 1974 in Frankfurt with Drs. BAUER and SCHNEIDER of the Institut für Dokumentationswesen and the Zentralstelle für Maschinelle Dokumentation, and discussed in detail the possibility of using a computer-based system for the above purposes. These agencies of the Federal Republic had no existing systems to handle the type of numerical data required by this project, and, according to these experts, it would be necessary to develop such a system specifically designed for the needs of the project. This, of course, was a costly undertaking for which funds were not in sight.

In addition, Prof. KERTES had established contact also with Dr. HILSENATH of the Office of Standard Reference Data, National Bureau of Standards, Washington, who kindly offered the assistance of the Data Systems Design Group in the preparation of the computer system needed for the project. The possibility had not been explored further.

In view of the agreement reached with the publisher, it was obvious that the production of the data sheets from a computer-based system was not practical for the time being. However, the second avenue, that of computerizing the numerical data for on-demand search, remained still open. If that possibility was to be explored further, the venture would have to be studied in detail and would probably require the establishment of a Solubility Data Research and Information Centre.

Dr. A. G. SCHONING (Sweden) had expressed willingness to assist the project in developing a computer data base when the first data sheets become available.

12. Recommendations for Publication of Solubility Data in the Primary Literature

In recent years, the International Council of Scientific Unions (ICSU) and IUPAC had been much concerned with the general problem of presentation of experimental and numerical data in the primary scientific literature. In September 1973 a UNESCO-UNISIST Task Group in frame of CODATA had published a general guide for presentation of data derived from experiments, and since a large number of 'sub-guides' for reporting data in various disciplines had appeared. Among them were fields such as chemical kinetics, crystallography, infrared spectra, magnetic spectra, thermal conductivity, thermochemistry and thermodynamics, gas chromatography, thermal analysis and others. Some of these documents were IUPAC approved recommendations, and at the Madrid meeting, the Council of the Union had approved a number of additional guides, among them 'Recommendations for Presentation of NMR Data for Publication in Chemical Journals', and 'Recommendations for Publication of Papers on Molecular Absorption Spectrophotometry in Solution between 200 and 800 nm' [published as Provisional Nomenclature Appendices Nos. 38 and 44 (respectively), to *Inf. Bull.*].

In terms of its reference, Subcommission V.6.1 should formulate such recommendations in the field of solubility data contributing therewith to the general IUPAC efforts aimed at higher scientific standards of chemical publications.

Prof.KERTES would prepare an outline of 'Recommendations for the Publication of Solubility Data', and would invite Members of the Subcommission for contributions. It should be noted that such a document was defined as an official IUPAC one and thus would have to be approved by IUPAC bodies concerned and endorsed by the Council of the Union.

13. Joint Meeting of Subcommissions I.2.2 and V.6.1

The joint meeting, initiated by Profs.WESTRUM and LAFFITTE (Chairman and Secretary, respectively, of Commission I.2) and chaired by Dr. COX (Chairman, Subcommission I.2.2), was held with the purpose of an exchange of information on the respective activities, and as far as Subcommission V.6.1 was concerned, with the intention to open channels of cooperation with individual Members of Subcommission I.2.2. It was believed that consultation with colleagues active in critical evaluation of data on the physical properties of gases, fluids and their mixtures, should be beneficial to the Solubility Data Project in its efforts to make the compilation and

evaluation work on solubility data as rigorously thermodynamic as practical for the complex heterogeneous systems it was to cover.

Dr. ANGUS outlined the mechanism of operation of the Thermodynamic Tables Project (TTP), and its scope, and Prof. KERTES briefed the meeting on the Solubility Data Project (SDP). Several questions of clarification on both projects were answered, and a number of suggestions were made to the SDP by colleagues associated with the TTP. So, Dr. ANGUS believed that the SDP should consider establishing a mechanism by which a periodical revision of critically evaluated solubility data could be done as new and more reliable data become available. Prof. KOHLER suggested that careful considerations should be given to the possibility of including in the data sheets thermodynamic functions, such as excess free energies in liquid-liquid solubility systems, and, in cases where pressure-dependent data are available, perhaps different kinds of treatment should be considered for systems with solubility data only, and for those for which there were auxiliary thermodynamic data. Dr. KEHIAIAN suggested the possibility of publishing only strictly solubility data in a handbook format, and systems for which enough primary numerical information was available in the form of a review paper in the *Journal of Reference Data*, and finally, in form of monographs to cover larger areas of solubility systems.

14. Election of Members

Profs. O. KUBASCHEWSKI and I. V. TANANAIEV were unfortunately unable to take an active part in the work of the Subcommittee, and, apparently, would not be able to do so in the near future.

Re-elected for the period 1975–77 were: Profs. CLIFFORD, KERTES, and NANCOLLAS, and Drs. SIGWORTH and YOUNG. New Members of the Subcommittee for the same period were nominated: Dr. A. F. M. BARTON (Australia), Prof. R. BATTINO (USA), Dr. H. L. CLEVER (USA), Dr. E. A. DANCY (Canada), Prof. S. S. DAVIS (UK), Prof. I. ELIEZER (Israel), Prof. W. GERRARD (UK) and Prof. P. HUYSKENS (Belgium).

Prof. KERTES was re-elected as Chairman for the period 1975–77.

15. Forthcoming Meeting

In almost all of the activities discussed at this meeting, commitments had been made for specific progress to be achieved within the next 10 months. For a good fraction of the activities the preparatory scientific work had progressed to the extent that the compilation work could start not later

than this fall. Most of the organizational and administrative work should be completed within the following few months.

In view of this timetable, the Subcommittee felt that an interim meeting should be held during the summer or early fall of 1976, if the first output generated by the project should reach the publisher in 1977.

Prof. TANAKA, President, Analytical Chemistry Division, had agreed to support the request, and to take the necessary steps which should ensure the financial support of IUPAC. Prof. KERTES had been charged to determine the site and time of the meeting in such a way that a maximum number of Subcommittee Members could attend it with a minimum of financial support requested from IUPAC. A budget estimate should reach the Division President by November 1975.

COMMISSION ON ANALYTICAL RADIOCHEMISTRY AND NUCLEAR MATERIALS (V.7)

3–6 September 1975

Present: Dr. M. B. A. CRESPI (Chairman), Prof. N. SAITO and Prof. R. E. WAINERDI (Acting Secretaries), Prof. L. KOSTA, Dr. M. SANKAR DAS, Dr. J. C. WHITE (Titular Members); Dr. D. COMAR, Prof. F. LUX, Dr. T. A. RAFTER, Dr. E. STEINNES (Associate Members); Ir. M. DE BRUIN (National Representative); Dr. ABDEL GHANI (Observer).

1. Minutes of Previous Meeting

The minutes of the meeting in Munich, during 23–27 August 1973, had been published in *Comptes Rendus XXVII Conference – Part B* (pages 207–212).

2. Reports

Published: (i) 'High Energy Photon Activation' [*Pure Appl. Chem.* 37 (1974), pp. 249–273].

(ii) 'Reference Materials for Trace Analysis by Radiochemical Methods' [Announcement in the *Inf. Bull.* No. 46 (October 1973), p.14].

Submitted: (i) 'Recommended Procedure for the Measurement of 14-MeV Neutron Fluxes from Accelerators for Activation Analysis'.

(ii) 'The Role of Nuclear Techniques in the Determination of Key Elements in Environmental Pollution: I. Lead.'

3. Opening Considerations

The agenda for the Madrid meeting of the Commission was adopted. Chairman CRESPI asked that Profs. WAINERDI and SAITO act as temporary secretaries in the absence of Dr. WHITE who had new responsibilities with the Division Committee.

4. Terms of Reference of Commission V.7

The terms of reference of the Commission drafted at the Munich meeting were considered. It was felt that slight modifications might be made. Many members stressed, in particular, the necessity to avoid duplication with other permanent IUPAC bodies covering radiochemical aspects which might

be created in the future. Dr. CRESPI was asked to make this opinion known to the President of the Analytical Chemistry Division.

5. Radioactive and Isotopic Specifications of Labeled Compounds

The Commission considered the development of this subject through the constitution of the joint IUPAC-IUB Committee. A report by Dr. GIRARDI (absent) was considered in which the problem areas identified in the first two meetings of the Committee held in 1974 were detailed. This was agreed upon by the Commission.

6. Intercommission Work on Trace Analysis

Dr. CRESPI reported that he had appointed Dr. STEINNES to cover the collaboration with Commission V.2 on the project 'Sensitivity of Trace Analysis'. Dr. STEINNES informed that he had contacted Dr. KOCH and the work was to be started in the near future under the coordination of Prof. MORRISON of Commission V.2.

7. Recommendation on the Use of Kale as a Standard Reference Material

Dr. SANKAR DAS submitted a final draft on this project. The draft was approved by the Commission with slight modifications and would be submitted to the Division Committee for approval.

8. Existing Rock Standard Reference Materials for Radioanalytical Use

Dr. STEINNES reported on his studies on the subject and advised the Commission on the inconvenience to recommend existing rock SRM as the amount left was very small. New standards were in preparation by USGS. As he would be visiting this institution for a 6-month period starting November of this year, he was assigned to follow this matter with a view to try to involve Commission V.7 at an early stage in the study of the new samples.

9. Teaching of Radiochemistry

Dr. CRESPI reported on the work done by Dr. GIRARDI (absent). Dr. GIRARDI's advice on the basis of the study of available reports on the

teaching of nuclear science was that they do not help very much for the assessment of drawbacks of present ways of teaching in the case of radiochemistry and that an international inquiry on the matter would be the best way to tackle the problem. A joint meeting was held with the Committee on Teaching of Chemistry, and it was agreed that the international infra-structure of the Committee should be used to help obtaining speedy results on the inquiry. Prof. SAITO reported on his talk with Prof. JORDAN and agreed to prepare a proposal for suitable radiochemical experiments to be included in instrumental analysis courses at the university level.

10. Glossary of Nuclear Terms

The final draft prepared by Ir. DE BRUIN was considered. After some discussion, the contents and the definitions of the new glossary were agreed inside the Commission. It was decided to send the draft to Commission V.3 and external referees for comments before submission to the Division Committee.

11. Nuclear Techniques for the Analysis of Key Elements in Environmental Pollution

The convenience of this project was reconsidered taking into account that the first paper planned for this series, on nuclear techniques for Pb analysis, had not found its way to publication through the IUPAC channels. Since this was related to IUPAC publication policy and it had importance for other work of Commission V.7, Dr. CRESPI was asked to raise general questions of IUPAC publication policy in this respect at the forthcoming Division Committee meeting.

12. Standard Reference Materials for Low-grade Uranium Ores

Prof. KOSTA informed that he had not considered that the Commission should try to recommend the existing IAEA standards as the amount still available was very small. However, new ones were being issued for which further comparative analyses were desirable. It was agreed to contact IAEA for that purpose. Discussions were held on other SRM available. It was considered that some of the materials available from IAEA would be suitable for radiochemical use, but that more extensive multinational analytical work was needed for some of them to improve the quality of data available. It was decided to approach IAEA in that respect.

13. Light Element Analysis by Radioanalytical Methods

The report of the project was discussed and it was agreed that it would be finished after placing emphasis on its compilation of data.

14. Nuclear Methods for the Analysis of Fissile Elements

Dr. GIRARDI reported by letter on the status of the project and advised that it should be suspended temporarily as some recent publications on the subject currently under study by him might make it necessary. This was agreed.

15. Separation Techniques in Radioanalytical Chemistry

The final draft presented by SAITO on Ion Exchange Separations in Radioanalytical Chemistry was approved. A deadline of 45 days was fixed to send him any suggestions, after which the report would be submitted to the Division Committee. It was agreed that the second part of the project would cover separations by solvent extraction.

16. Data Flagging Project

Prof. WAINERDI reported that flags suggested by Commission V.7 had been accepted by the Committee on Data Flagging. He also reported on the possibility to test the project by use of flags voluntarily by journals. It was agreed that this would be a good way to put the project in operation, and Prof. WAINERDI was instructed to reflect this at the Meeting on Data Flagging on 3 September.

17. Compilation of Radioanalytical Data

The report sent by Dr. HOSTE (absent) on data of resonance integrals determined at his laboratory was considered. It was agreed that these data should be included in a complete compilation on the subject. It was also pointed out that the recent appearance of a comprehensive IAEA compilation might make this unnecessary. It was agreed that Dr. HOSTE should look into this matter and advise the Commission accordingly, as the interest of the Commission of issuing critical compilation of the data specifically directed to the radiochemical community continued.

18. Register of Radioanalytical Workers

The implementation of the World Register of Radioanalytical Chemists

discussed at the previous Commission meeting was further discussed in the light of the information of the Secretariat and the Division Secretary that IUPAC would be unable to provide clerical help and a fund to keep such a file. It was pointed out that the project could not be put into operation without this help and it was reluctantly decided to terminate this project.

19. Nuclear Techniques for the Analysis of Molecular Compounds involved in Environmental Pollution

Prof. KOSTA reported on his examination of this question. He considered that the amount of work done on it was not enough to merit revision and consolidation at the present time, and advised the Commission to consider a broader report covering also other field of applications. This was agreed and the present project terminated.

20. Analysis of Thorium and Thorium Compounds

Dr. SANKAR DAS presented an outline of annotated bibliography of analytical chemistry of thorium excluding nuclear methods. Agreements were obtained inside the Commission on detailed contents of the project.

21. Current Applications of Semiconductor X-Ray Detectors in Chemical Analysis

The report by Dr. WHITEHEAD on this subject (old title: Charged-Particle-Induced X-ray Fluorescence) presented by Dr. RAFTER was considered. The content was approved by the Commission. It was decided to submit the report to the Division Committee for quick publication, if possible.

22. World Conference of Radioanalytical Chemistry of Nuclear Materials

Discussions were held on the possibility to organize by the Commission a Conference on this subject, as it was felt that it was necessary to consolidate many smaller initiatives in a really comprehensive one of interdisciplinary character. It was expressed that the Conference of this type should obtain supports from international and national organizations and national nuclear energy authorities and industrial enterprise. It was agreed to survey the prospect of organization during the next 2 years in order to reach decision at the time of next conference. The possible tentative date of the proposed conference would be 1979 or 1980.

23. Radioanalytical Problem associated with Fusion Reactors

The importance of chemistry in relation to the development of nuclear fusion reactors was stressed. Many members felt that this was not usually recognized because fusion research was considered primarily a physical subject. It was decided to look into this matter in order to identify the chemical aspects of significance and Dr. CRESPI was asked to make a preliminary report on the subject.

24. Critical Evaluation on Radioimmunoassay and Related Methods

The increasing development of radioimmunoassay and other radiobiological methods of analysis in recent years was recognized. Some members mentioned that the largest percentage of routine radioanalytical work was currently done in this area and that critical evaluation of that development was urgently necessary. This was approved and Dr. COMAR was assigned to the task.

25. Analytical Aspect of the Dating of Carbonates by Uranium and Thorium

The necessity to critically examine radioanalytical problems in dating with natural radionuclides was discussed, and it was considered that the subject indicated above was a good starting-point to get the Commission involved in the general problem. Dr. RAFTER was asked to look into the matter deeply and report to the Commission accordingly.

26. Nuclear Data

A joint meeting with Dr. HOLDEN in charge of nuclear data supervision at BNL was held through his initiative in order to establish a permanent link with our Commission for the purpose of filling the need of radioanalytical community. It was agreed that close contact would be maintained in the future.

27. Any Other Business

A letter was also considered covering a spontaneous presentation of a scientist interested in participating in the Commission work. The letter was handed over to a Member of the Commission of the same nationality with the request

to explore the convenience of the proposal.

28. Elections

The proposed composition of the Commission for the next biennium was decided by election. Prof. WAINERDI was elected as the new Chairman to succeed Dr. CRESPI. As Dr. WHITE had been elected as the new Secretary of the Division Committee and was no longer eligible to serve the Commission as Secretary, Prof. SAITO was elected as the new Secretary to replace Dr. WHITE. As to Titular Members, Dr. GIRARDI and Prof. SAITO were re-elected for an additional 4 years, and Dr. RAFTER and Dr. SMALES, former Associate Members, were elected as new Titular Members. Dr. CRESPI had completed his term of office as Titular Member and he was elected as a new Associate Member. No other new Associate Members were nominated during the Conference. It was planned to fill three vacancies in Associate Membership by correspondence during the interconference period. As National Representative for the Federal Republic of Germany, Prof. K. H. LIESER was accepted by correspondence before the Conference. One of the Associate Members Prof. MINCZEWSKI retired in Madrid.

APPLIED CHEMISTRY DIVISION COMMITTEE

2, 5 and 7 September 1975

Present: Dr. H. EGAN (President), Dr. R. W. CAIRNS (Past-President), Prof. H. SUOMALAINEN, Dr. W. G. STOLL (Vice-Presidents), Dr. J. A. EPSTEIN, Dr. W. W. MEINKE, Dr. K. WEISSERMEL, Dr. A. F. LANGLYKKE, Dr. A. J. COLLINGS (Secretary) and by invitation Prof. A. HUMPHREY, Prof. S. J. PIRT, and (7 September only) Dr. R. MARCUSE.

1. Minutes of Previous Meeting

The minutes of the meeting held in Bedford during 10–11 July 1974 (IUPAC *Inf. Bull.* No. 48, pp. 62–66) were approved.

2. Reclassification of Sections into Commissions

Dr. EGAN recalled the decision to plan for the reorganization of six Sections into eight Commissions, with arrangements for the Committee to take a fuller role in the policy management of the divisional programmes. Dr. CAIRNS considered that it was important that Sections or Commissions should not operate independently of the Division. The meeting adopted a suggestion by Dr. EPSTEIN to associate a member of the Division Committee to each Commission as a Corresponding Member, to assist in the interpretation of the work of Commissions to the Division Committee and to represent the views of Commission to the Committee. The following Commission liaison arrangements were agreed: Air Quality, Dr. COLLINGS; Water Quality, Dr. EPSTEIN; Fermentation, Dr. LANGLYKKE; Food Additives and Food Contaminants, Prof. REYMOND; Oils & Fats, Dr. MARCUSE; Residue Analysis and Terminal Residues, Dr. STOLL; Reclamation of Solid Wastes, Dr. FREYSCHUSS.

3. Reclamation of Solid Wastes

Dr. EGAN welcomed Prof. PIRT and Prof. HUMPHREY who had been requested to make proposals regarding chemical aspects of the problem of the reclamation of solid wastes. It had not proved possible to appoint a third member to the team from Japan. Prof. PIRT said that with Prof. HUMPHREY he had considered reclamation as a recycling problem. There was a need to classify wastes on a chemical basis and a project was proposed to consider this in relation to quantity and location. The means of reclamation should be

considered with special reference to energy conversion, chemical recoveries, pollution abatement, and possible toxicity aspects. Any IUPAC contribution should be on a global basis and could best be initiated by a Commission charged with collecting data on the type, quantity, and location of methods in current use and identifying research needs. It was noted that several other organizations such as CEFIC were active in the field but IUPAC could act as coordinator. Prof. PIRT considered that the Commission should also make recommendations for a small symposium, with about eight main speakers and a total attendance of about forty and recommended that approval be sought for a small Commission to be set up for this. Dr. MEINKE supported, Dr. CAIRNS seconded the adoption of Prof. PIRT's proposal and requested him and Prof. HUMPHREY to prepare a formal proposal for setting up a Commission on the Reclamation of Solid Wastes.

4. Project Evaluation

Dr. EGAN reminded the Committee of its responsibilities for the Division's work programme, its financial aspects and its scientific content. Sections and Commissions had been asked to complete project proposal forms and this had been interpreted differently by different Sections. Dr. EPSTEIN expressed disappointment at the amount of information received on the Project Evaluation forms and felt that still more consideration should be given to diversification. Dr. MEINKE expressed appreciation of the proposals which had been made by the Food, Oils & Fats and Water Sections: no reports had been received from the Air Quality Section. The Committee discussed (on 7 September) with Dr. PILZ and Dr. DROPE proposals for the programme of the Air Quality Section and it was agreed that these should be referred to an *ad hoc* Committee under the chairmanship of Dr. FREYSCHUSS and that no new members should be appointed to the new Commission on Air Quality for the time being. It was agreed that members' evaluations of individual Section projects should be sent to Dr. EPSTEIN by 30 November 1975 for collation and Dr. EPSTEIN agreed to give further consideration to the design of the project evaluation form.

5. Analytical Chemistry Division

Dr. EGAN stated that the Analytical Chemistry Division had appointed Prof. H. FREISER for liaison with the Applied Chemistry Division. Dr. COLLINGS' appointment as the Liaison Officer for the Applied Chemistry Division was confirmed.

6. Proposed Division of Health and Environmental Chemistry

Dr. EGAN invited comment on proposals circulated earlier by Mr. ARNOLD to replace the Applied Chemistry Division with a Health and Environmental Chemistry Division. The Committee considered that programmes of environmental interest could be included in all Divisions where appropriate but that it was too early yet to bring these together into a single division. It would also be wrong to change the name of the Applied Chemistry Division at a time when greater industrial participation was being discussed.

7. Revision of Statutes and Bylaws

Following a detailed discussion of the implications for the Division of the changes proposed to IUPAC Statutes and Bylaws, the difficulties seen by the Division were summarized as the need to recognize by membership Sub-commissions or Working Groups, the need in some cases to allow additional National Representatives to participate in the work of a Commission and, in other cases, for coordination between those Commissions which at present fall within a single Section. These points were embodied in a statement proposed by Prof. SUOMALAINEN for discussion at the Open Meeting of the Division on 5 September and were subsequently incorporated in the President's report to Council on 9 September.

8. Division Committee

Following the Open Meeting of the Division on 5 September the President announced the membership of the Division Committee as Dr. H. EGAN, President; Prof. H. SUOMALAINEN, President-Elect; Dr. W. G. STOLL, Vice-President; Dr. A. J. COLLINGS, Secretary; and Dr. J. A. EPSTEIN, Dr. H. FREHSE, Dr. S. FREYSCHUSS, Dr. A. F. LANGLYKKE, Dr. R. MARCUSE and Prof. D. REYMOND, Members. It was agreed that Dr. K. R. HILL and Dr. D. B. TONKS be appointed Coopted Members of the Committee.

9. International Company Associates Group

Dr. EGAN reported that he and Dr. COLLINGS, had, by invitation, attended the meeting of International Company Associates Group on 4 September, where interest in environmental aspects and programme diversification had been evident. An increase in industrial input into IUPAC programme had been welcomed, with the possibility of appointing Industrial Members to Division Committees.

10. Interdivisional Committee on Nomenclature and Symbols

Dr. COLLINGS reported that the representative of the Division on the Interdivisional Committee, Prof. S. J. PIRT, wished now to retire from the Committee. It was agreed that Dr. EGAN should be appointed.

11. Air Quality Section

Dr. EGAN reported that no reports had been received from the Air Quality Section. Following discussions with the Chairman-Elect Prof. PILZ it was agreed that, in cooperation with Prof. PILZ, Dr. FREYSCHUSS should be invited to chair an *ad hoc* Committee, on which Dr. A. J. COLLINGS and (by invitation) Dr. TONKS would also serve to make recommendations by 30 April 1976 on a diversified programme (taking into account the interests of the Section on Clinical Chemistry). It was also agreed that Dr. E. DROPE should be invited to act as Secretary to the new Commission on Air Quality.

12. Extensions of Membership

In discussing the difficulties encountered in the implementation of the proposed revision of the Statutes and Bylaws to which Prof. SUOMALAINEN had directed attention (minute 7), it was agreed to seek the approval of the Bureau for the extension of membership beyond the normal term for specified key members of the Sections and Commissions.

13. Divisional Rules

Following a discussion on the procedure for electing members of the Divisional Committee in which it was suggested that a ballot (where such was necessary) by post in advance of the meetings was desirable, Prof. SUOMALAINEN agreed to draft Divisional Rule for consideration at the 1976 meeting.

14. Next Meeting

At the invitation of Dr. WEISSERMEL, it was agreed that the next meeting of the Division Committee would be held in Frankfurt on 7, 8 July 1976. Chairmen of Commissions would be invited to attend; but IUPAC funds would not be available for Secretaries, who could, however, also be free to attend if they so wished.

**Joint Meeting of Applied Chemistry Division
Committee and Chairmen and Secretaries of
Sections and Commissions**

2 and 5 September 1975

Present: Dr. H. EGAN, Dr. R. W. CAIRNS, Dr. W. G. STOLL, Prof. H. SUOMALAINEN, Dr. W. W. MEINKE, Dr. A. F. LANGLYKKE, Dr. J. A. EPSTEIN, Dr. K. WEISSERMEL, Dr. A. J. COLLINGS (Division Committee); Dr. R. MARCUSE, Mr. B. A. SCHATZ (Food); Drs. H. J. VOS, Prof. C. PAQUOT, Prof. E. L. DELVAUX, Mr. A. MØLLER (Oils & Fats); Dr. S. FREYSCHUSS, Mr. B. GÖRANSSON (Water Quality); Dr. K. HILL, Dr. H. FREHSE, Prof. P. KOIVISTOINEN (Pesticides); Mr. J. L. MONKMAN (Air) and, by invitation, Prof. D. REYMOND.

1. Divisional Programme

Dr. EGAN opened the meeting by welcoming all present and thanking Chairmen and Secretaries of Sections and Commissions for their reports and proposals for the work of the Division. This had enabled the Division Committee to have a much fuller appreciation of the shape and direction of the Divisional programme. Referring to the project evaluation proposals system, he said that this could not be introduced instantaneously but would evolve in consultation with the officers. The project evaluation form at present used would be revised and those present were invited to send their written comments to Dr. COLLINGS.

2. Revision of Statutes and Bylaws

Dr. EGAN reminded the meeting that under the revisions proposed, Sections would report direct to the Bureau. The Sections of the Applied Chemistry Division were insufficiently diversified to be regarded as Sections in this way so it had been proposed that the present Sections would be succeeded by eight Commissions, based on Food Additives, Food Contaminants, Oils and Fats, Air, Water, Fermentation, Terminal Pesticide Residues, and Pesticide Residue Analysis. He had reassured the Swedish National Committee that there was no intention of 'abolishing' current programmes although there would be a particular need for coordination between certain Commissions. The British National Committee had already written concerning the need for coordination between the Fermentation and Water Quality Sections in the area of the disposal of solid wastes. The revised arrangements would also

facilitate the diversification of the Division's work.

3. Finance

Dr. EGAN thanked the Section and Commission Officers for the manner in which they had responded to the need to control expenditure carefully. Budget control of the programme was essential in fairness to all members of the Division and it might be necessary for the Division Committee to decide on priorities from time to time. The Air Quality Section had submitted no progress reports and the Division Committee would hold all Titular vacancies open until an acceptable programme had been proposed and agreed. Dr. COLLINGS would be writing to Commission Secretaries regarding budgets for 1976.

4. Membership

Dr. HILL raised the question of who could propose members for IUPAC Commissions and asked whether nominations from national adhering bodies were in order. It was agreed that the statutes authorized such nominations but the Commission had the right to select from the nominations and such adhering bodies could appoint a National Representative to each Commission.

5. Proposed Health and Environmental Chemistry Division

Dr. EGAN said that the Division Committee had considered Mr. ARNOLD's proposal. There were strong environmental chemistry interests in the division but health interests (as opposed to 'health chemistry' interests) were less appropriate. However, it was not thought appropriate to replace the Applied Chemistry Division by an environmental division, especially with the current development of industrial interests in IUPAC programme.

6. Future Programme

Dr. EGAN requested details of new project proposals, following Section and Commission Committee discussions, by 30 October 1975; and reviews of progress on individual projects by 15 April 1976 for consideration by the Divisional Committee in July 1976.

**Joint Meeting of Division Committees of
Analytical Chemistry Division and Applied Chemistry Division**

2 September 1975

Present: Dr. H. EGAN (President), Dr. R. W. CAIRNS, Dr. W. W. MEINKE, Dr. A. F. LAGLYKKE, Dr. K. WEISSERMEL, Dr. W. G. STOLL, Dr. J. EPSTEIN, Prof. H. SUOMALAINEN, Dr. A. J. COLLINGS (Applied Chemistry Division).

Prof. N. TANAKA (President), Prof. W. KEMULA, Mr. R. FENNELL, Prof. D. N. HUME, Prof. YU. A. ZOLOTOV, Prof. O. SAMUELSON, Dr. J. C. WHITE, Prof. E. PUNGOR (Analytical Chemistry Division).

Dr. EGAN opened the meeting by thanking Prof. TANAKA for the invitation to take the chair with Mr. FENNELL.

1. Methods of Analysis

Prof. TANAKA said that the Analytical Chemistry Division had considered the ISO recommendation for the presentation of methods of analysis ISO/DIS 78/II and said that, a few small items of terminology apart, it considered this to be acceptable. Dr. EGAN said that the Oils & Fats Section was already using the recommendation and it was agreed to adopt it in principle.

2. Environmental Interests

Dr. EGAN drew attention to the high analytical interest in environmental matters, in the context of the proposed Division of Health and Environmental Chemistry to be discussed by the Bureau. Prof. TANAKA said that the applied analytical aspects were at present proper to the Applied Chemistry Division but agreed that there was continued need for close liaison between the Analytical and Applied Chemistry Divisions. It was agreed to continue the appointment of liaison officers, Dr. J. C. WHITE acting for the Analytical Chemistry Division and Dr. A. J. COLLINGS for the Applied Chemistry Division.

3. Harmonization of Collaborative Studies

Dr. EGAN recalled earlier correspondence on the desirability of bringing together those concerned with organizing collaborative analytical studies with the view to considering the harmonization of principles for conducting

these and selecting methods of analysis. Mr. FENNELL said that although the Analytical Division Committee had not discussed the matter in Madrid and had suggested at earlier meetings that the subject would be better dealt with by the Applied Division, it would now reconsider the matter: the Committee subsequently appointed Prof. H. FREISER to act as Special Liaison representative of the Analytical Chemistry Division in discussions of this project with the Applied Chemistry Division.

4. Trace Metals in Animal Feeds

Mr. FENNELL reported that the International Company Associates Group had drawn attention to the need for monitoring trace metals in animal feeds. It was agreed to refer the matter to the Food Contaminants Commission.

5. Next Meeting

It was agreed that the Committees should meet again in 1977; and that the Committee of the Section on Clinical Chemistry should also be invited to join the meeting. A limited joint meeting would be desirable in 1976 also, if this could be arranged.

SECTION ON FOOD (VI.1)

2–6 September 1975

Present: Dr. R. MARCUSE (Chairman), Dr. H. GUTHENBERG (Secretary), Dr. E. O. HAENNI, Dr. K. KOJIMA, Dr. K. OHNO, Mr. M. V. TRACEY, Dr. A. E. WASSERMAN (Titular Members); Dr. A. J. COLLINGS, Dr. P. L. SCHULLER, Prof. R. TRUHAUT (Associate Members); Dr. F. BRO-RASMUSSEN (National Representative); Prof. D. REYMOND, Mr. B. -A. SCHATZ (Observers).

1. Chairman's Opening Remarks

Prof. BELITZ, Dr. GUTHENBERG, Dr. HOWARD and Dr. SOMERS had sent their resignation. The Chairman, on behalf of Members, expressed Section's appreciation for their collaboration during the years and his regret for their decision to leave the Section.

The Chairman welcomed Prof. D. REYMOND (Vevey, Switzerland), and Mr. B. -A. SCHATZ (Eslöv, Sweden) as Observers. He further welcomed Dr. F. BRO-RASMUSSEN, Copenhagen, who had taken part in last year's annual meeting as an Observer and now attended the meeting as a National Representative.

2. Minutes of Previous Meeting

The minutes of the annual meeting of the Section and its Commissions in Warsaw on 25–27 July 1974 [see *Inf. Bull.* No. 49 (March 1975), pp. 35–47] were approved.

3. Reports on Main Activities since Previous Meeting

Short reports on the activities of the Committee and the Commissions had been distributed to Members prior to the meeting. The Section Committee had been involved in problems connected with diversification of the programme and restructuring.

The Chairman had participated in meetings with the Coordinating Committee for Analytical Methods for CEE on 30 July 1974 in The Hague and on 9 May 1975 in Birmingham. He had further participated as an Observer in part of the JECFA (= Joint FAO/WHO Exp. Comm. Food Addit.) Meeting in Geneva in April 1975.

It had been suggested that the draft report of this meeting be distributed

to Members for comments. It was questioned if comments could be expected from other Members than those already directly involved as Experts. It was found that this indeed was the case.

Dr. MARCUSE had suggested that measures should be taken by IUPAC in order to increase the output of meetings by better consideration of linguistic difficulties. Particularly should speakers whose mother language is English to a greater extent consider the difficulties of other participants. Members gave their full support and stressed that further measures should be envisaged to make the action more effective.

Dr. HAENNI and Dr. KOJIMA presented and commented on activity reports of the Commissions on Food Additives and on Food Contaminants.

4. Report on Special Activities

The activity of the Food Section Committee had to a great extent been devoted to diversification of the programme as requested by the Division. Possibilities for such a diversification were studied and, among other items, the following projects developed:

- (i) Control of purity requirements for food additives.
 - (ii) Factors for edible quality of meat.
 - (iii) Rapid methods for food analysis.
- (i) With respect to 'Control of Purity Requirements for Food Additives' a Working Party discussion with representatives from numerous international and national organizations interested in this field had been organized in The Hague in July 1974 as a follow-up of a similar Round-Table discussion in Hamburg in 1973. The special aim of the discussion in The Hague was to examine how IUPAC — possibly in collaboration with IUFOST — could contribute to the world-wide endeavours of FAO/WHO for the establishment and control of specifications of purity of food additives.
- A preliminary report on this meeting, mainly edited by Mr. D. DODGEN (Washington), had been sent to the participants and to interested organizations. Based on this report, proposals for future collaboration with FAO/WHO were expected.
- (ii) The project 'Factors for Edible Quality of Meat' was to be regarded as a 'type study' for further work on quality aspects of food. A background report by Dr. A. WASSERMAN had been commented on by experts. As next step a 'basic letter' was sent to more than thirty research workers in order to establish major aspects of the problem and the interest of the investigators to participate in a project.

Questionnaires had been elaborated in order to arrive at concrete ideas for the handling of the matter. Particular interest was devoted to relations between chemical and sensory or rheological properties. Possibly the organization of a symposium or a working party on 'edible quality of meat' could provide a survey on research going on and problems to be tackled.

Dr. WASSERMAN commented that tenderness or lack of tenderness appears to be the major quality interesting the consumer and that different national habits with respect to food and methods of preparation would be important factors to be considered.

About ten experts had indicated their interest for participation in a collaborative study.

It was recommended:

- to contact organizations like ISO and IUFOST in order to establish whether they are interested and active in this area;
- to survey the literature on tenderness as a quality factor and on relations between chemical and sensory properties of meat;
- to contact research workers in order to more clearly define problems and to obtain suggestions for tackling them.

It was concluded that meat quality was a very complex problem including physiological and psychological aspects and requiring sensory and rheological methods. Further, a need was established to exist for rapid methods like the hypoxanthine test for the determination of meat quality as well as for the unification of methods and nomenclature in this field.

(iii) The Project 'Rapid Methods for Analysis' was discussed in a special meeting arranged during the Conference in Madrid. Originally it had been planned to organize in connection with this Conference a working party with representatives of Industry for basic discussions. This plan had, however, shown to be difficult to realize. The special meeting in the frame of the Conference was, therefore, of only a preliminary and limited character. Prof. D. REYMOND (Vevey, Switzerland) an expert on industrial and analytical food chemistry had agreed to be in the chair, and Members of other units of IUPAC had been invited to take part in the discussions. The meeting arrived at certain agreements for further handling of the matter and regarded analysis of nutrients in processed foods to be an area of great interest and high priority. For details see special Minutes of the meeting.

5. Divisional Matters: Restructuring

The Chairman informed Members on plans for restructuring. He referred to

information given at last year's annual meeting and contained in circular letters to Members of 15 November 1974 and 2 July 1975. Extracts of Members' comments had been compiled and forwarded to the President of the Division.

The Chairman and the Secretary had met with the President of the Division in February and had discussed measures in case of an adoption of the proposed statutes. It was agreed that in such a case the Section consisting of the Section Committee and the two Commissions, should be replaced by the two Commissions and a Coordinating Committee. The Chairmen of the Commissions had agreed to such a solution. It was presumed that the new structure would be listed in the *Comptes Rendus*.

More recently it had been proposed to – more or less – replace the Applied Chemistry Division by a Division on Health and Environment, further to create a new Commission on Solid Wastes.

The Division had elaborated a procedure for the evaluation of projects (project proposals and project reviews) by Members of the Division Committee which had been commented on by the Chairman by letter to the Division.

A report on activities of the Division and its Sections (Commissions) by the Division President to the IUPAC Bureau had been distributed to Members. These items were discussed by Members who expressed concern with respect to the proposed reorganization and presented alternative proposals. They had, however, also been discussed in Open Meeting with the Division the day before and therefore Members did not regard that further action was needed.

6. Liaison with other Sections and Commissions

The Chairman informed Members on contacts he had had with other Sections and Commissions within IUPAC, mainly with V.1, VI.3, VI.5, VI.6, and III.4. Joint meetings with some of these bodies were arranged during the Conference in Madrid. In order to save time for fruitful discussion it had been proposed to distribute in advance condensed activity reports together with the draft agenda including items of mutual interest. The system had in some cases worked out well, in other cases not. It should be applied again next time, early enough for 'feed-back'.

Based upon experiences in all joint meetings it was proposed that condensed lists of projects – with names of Members in charge of them – should be distributed to other IUPAC-units which might be interested, in order to stimulate and promote member-to-member-contacts.

As earlier agreed Commission V.1, together with the Section on Food, was

expected to develop guidelines for collaborative testing.

7. IUPAC/CEE Matters

IUPAC/CEE matters had been handled by the Coordinating Committee for Analytical Methods for CEE and IARC with collaboration of the Section on Food. The Committee had meetings on 30 July 1974 in The Hague, on 9 May 1975 in Birmingham and on 6 September 1975 in Madrid. A new contract for 1976 had been announced by a recent letter from CEE to Prof. TRUHAUT. The new contract relates to four methods and the updating of methods for heavy metals in food colors. A time schedule for submission and evaluation of the methods was proposed. However, not all details were available and Prof. PELLERIN was to send CEE documents on the requirements to Drs. MARCUSE, KOJIMA and HAENNI.

8. Liaison with IUFOST

The chairman reported on various contacts he had had with IUFOST throughout the year. He mentioned the discussion which had taken place in 1973 in Hamburg with representatives for IUFOST and IUPAC, in which the interest of both organizations for certain collaboration and for mutual exchange of information had been agreed upon. The contact with IUFOST was now through Prof. H. -J. BIELIG, Berlin, as chairman of the Scientific Activities Committee of IUFOST.

The Working Party Conference in The Hague on 29 July 1974 on 'Purity Requirements for Food Additives' had been arranged as a joint IUPAC/IUFOST meeting. Also next year's Symposium 'Advances in Smoking of Foods' in Warsaw (8-10 September 1976) would be handled as a joint IUPAC/IUFOST matter. Prof. RUTKOWSKI informed Members on details of the Symposium. Several projects in the programme of the Food Section had been stated by IUFOST to be of mutual interest.

Meetings planned by IUFOST could be of interest also to IUPAC, e.g. a meeting on 'Needs of Developing Countries' (September 1975, London) and a planned Working Party Conference on Food Legislation and Food Additives. Some Members expressed their interest and asked for details. On the whole, Members of the Section would appreciate receiving early information by IUFOST on matters of mutual interest.

9. Collaboration with Other Organizations

Certain collaboration had occurred with some intergovernmental agencies

like FAO/WHO, Codex Alimentarius and the JECFA-Committee concerning control of purity requirements for food additives:

- with CEE concerning methods of analysis for food additives,
- with ISO concerning checking of standard methods,
- with PAG concerning SCP and protein analysis (particularly for cereal breeders).

Members were also informed on certain contacts with other national and international organizations, e.g. the International Association for Cereal Chemistry, the Danish Stabilizers and Emulsifiers Manufacturers Association and the Nordic Committee on Food Analysis.

Dr. KOJIMA, Dr. CAMPBELL and Mr. WALKER referred to health criteria documents to be published by WHO which might be of interest for Members of the Section and should be available through Dr. VOUK, WHO.

10. Guidelines for the Running of the Section

Earlier, a need had been felt to develop guidelines and rules for the running of the Section and its Committee and preliminary proposals had been elaborated including guidelines, for example, the selection of new Members and new projects. It was felt that such guidelines would be applicable also in case the proposed new statutes were adopted and a Coordinating Committee on Food Chemistry would replace the Section Committee. Dr. HAENNI, Dr. KOJIMA and Dr. MARCUSE agreed to collaborate in order to amend these proposals.

11. Programme for 1975—1976

The programme of the Section included those of the Commissions and the Section Committee. Lists of projects had earlier been compiled by Dr. COLLINGS, Secretary of the Division Committee. Projects of the Commissions were listed in the reports and/or minutes of the Commissions.

Projects of the Section Committee were:

- Control of purity requirements of food additives,
- Factors of edible quality of meat,
- Rapid methods of food analysis,
- Symposium on Smoking of Foods, Warsaw 1976.

Dr. KOJIMA proposed that a project on SCP be handled on Section level since other IUPAC units as well as organizations outside IUPAC were involved.

As regards the project on Sn in food Dr. KOJIMA referred to a document

prepared by Dr. CHEFTEL (Paris) claiming that the toxic effect of Sn depended much upon its status in foods and commented that, consequently, analysis of Sn itself was not of sufficient interest to justify continued study at present. It was agreed to delete the project.

Dr. HAENNI proposed that when publishing reference methods, it should be indicated in which cases they were applicable. Dr. SCHULLER commented that methods should only be recommended for specified foods after having been tested for such use. Prof. BILLEK suggested that methods should be divided into two parts: cleaning-up and measurement, which would facilitate indications on applicability.

Further, the importance of thorough selection of new projects was stressed. More than one member should be charged with such selection.

Dr. KOJIMA, on behalf of the Food Contaminants Commission, stressed the importance of work to be done on principles of collaborative testing.

12. Membership

Membership was discussed in a closed session by Members. Recommendations forwarded to the Division were based upon the Membership as proposed at the annual meeting in Warsaw in 1974, vacancies due to resignation and proposals for continued or new membership obtained by the Chairman.

Resignations had been received from Prof. BELITZ, Dr. HOWARD and Dr. SOMERS. Dr. GUTHENBERG, who had resigned as Secretary of the Section, proposed to have his Titular Membership replaced by Associate Membership. Dr. FISCHBACH had also resigned. In some cases extension of membership was recommended.

13. Publications

Publications were in general discussed on Commission level. References to publications – either finalized or in the state of finalization – had been made in the reports (minutes) of the Commissions.

On Section level a preliminary report on the Working Party Conference on 'Control of Purity Requirements for Food Additives' in July 1974 in The Hague had been distributed, mainly edited by Mr. D. DODGEN.

14. Reports to the Applied Chemistry Division

Reports by the Section Committee and the Commissions on their meetings in Madrid had been (or will be) delivered to the Division.

15. Time and Place of Next Meeting

It was agreed that the next meeting should be placed in between the Symposium on Smoking of Foods, which presumably would take place during 8–10 September 1976 in Warsaw, and the 3rd Symposium on Mycotoxins presumably to be arranged during 16–18 September in Paris.

Two alternatives for the place of the meeting were discussed: Prague and Paris. The majority of the Members preferring Paris, the meeting would presumably take place in Paris during 13–15 September.

16. Other Business

The Chairman informed Members on the following meetings:

- FAO/WHO Symposium on the Use of Anabolic Agents and its Public Health Aspects, March 1975, Rome,
- 12th meeting of ISO/TC 34 – Agricultural Food Products, Ankara, Turkey, 2–3 October 1975.

A letter had been received from Dr. FISCHBACH concerning “publication vs. referencing IUPAC methods which had also been adopted by other bodies”. It was agreed that this aspect should be considered in future work.

Dr. KROGH informed on a ‘Symposium on Ochratoxin’ in Rome in June 1976 and Dr. CAMPBELL mentioned an AOAC meeting in October 1975 on the ‘Importance of Mycotoxins’.

**Joint Meeting of the Sections on Food (VI.1)
and on Oils and Fats (VI.3)**

4 September 1975

1. Drs. VOS (VI.3) was elected Chairman with Dr. MARCUSE (VI.1) as Vice-Chairman and Dr. GUTHENBERG (VI.1) as Secretary for the meeting.
2. Reports on activities of the two Sections had been exchanged in advance between Chairmen and other Titular Members of the two sections. The general discussion was, therefore, limited to comments by Chairmen. Items of a special mutual interest were discussed as next item on the Agenda.
3. Dr. MARCUSE reported on the activities of the Food Section Committee: projects concerning purity requirements for food additives and, particularly, rapid methods for food analysis. The report of a working party (The Hague, August 1974) on purity requirements was also presented. Dr. MARCUSE gave a report of the discussion on rapid methods (arranged the day before under the chairmanship of Prof. REYMOND) in order to prepare future work in this field.
4. Dr. HAENNI (Chairman of the Commission on Food Additives VI.1.1) reported that a survey of methods for individual antioxidants in foods had been completed and would be published in a supplement updating the 1971 IUPAC survey on Available Methods for Estimating Some Food Additives. A survey of multiantioxidant procedures had also been completed to form the basis for selecting a candidate method for IUPAC collaborative study — such study to be coordinated as far as possible with the parallel studies by the Section on Oils and Fats on antioxidants in lipids.
5. Dr. KOJIMA (Chairman of the Commission on Food Contaminants VI.1.2) explained the projects of the Commission on Food Contaminants:
 - (i) Analytical methods for trace elements such as mercury, cadmium, lead, copper, and selenium in food.
 - (ii) Analytical methods for mycotoxins in food.
 - (iii) Food contaminants derived from food packaging and containers.
6. Drs. VOS and other Members of VI.3 presented a survey of the projects of the Section on Oils and Fats and its two Commissions.
 - (i) Dr. LEVIN asked for comments on migration of VCM (vinylchloride monomer) from packaging material in food.
 - (ii) Drs. HENDRIKSE informed Members on various aspects concerning the determination of free and esterified tocopherols. Some of the most promising methods would be considered

for further study by collaborative tests. (iii) Dr. LEVIN presented comments on the determination of *cis-cis* linoleic acid in oils and fats. The results of this year's test justify continuation of the investigations. (iv) Prof. WESSELS discussed changes occurring during deep fat frying and methods for their determination, of which some would be studied as part of the next programme. (v) Mr. MØLLER gave a report on identification and determination of emulsifiers. Some of the most promising methods would be studied by the relevant working group under the chairmanship of Dr. BRÜSCHWEILER.

7. In some cases the two Sections, apparently, were involved in similar items which, however, were treated from different points of view. Section VI.3 was mainly interested in determination of components and additives in oils and fats, while the interest of the Section VI.1 was particularly focused on determination in food. This refers, for example, to the determination of heavy metals and of antioxidants. Contacts between Members involved in the projects of the two Sections would be useful to both Sections.

8. Summarizing the discussions the Chairmen of VI.1 and VI.3 stressed the need for early mutual information on projects in the pipeline and names of delegates in charge of them. They also confirmed the value of joint meetings of their Sections and the desirability of further concentration of the discussions on items of mutual interest.

COMMISSION ON FOOD ADDITIVES (VI.1.1)

2-5 September 1975

Present: Dr. E. O. HAENNI (Chairman), Dr. A. E. WASSERMAN (Secretary), Prof. G. GRIMMER, Dr. F. POUILLAUDE (Titular Members); Mr. D. F. DODGEN, Dr. S. J. KUBACKI, Mr. E. A. WALKER (Associate Members).

1. Minutes of Previous Meeting

Minutes of the previous meeting held in Warsaw during 25-27 July 1974 [published in *Inf. Bull.* No. 49 (March 1975), pp. 40-43] were approved with a recommendation for an addendum pointing out that subsequent to the Commission meeting it was agreed at the meeting of Section on Food that the Food Contaminants Commission would assume the project of vinyl chloride in food-packaging materials. Mr. WALKER would turn over the information he had available on the subject to the Food Contaminants Commission.

2. Reports on Current Projects

(i) Mr. WALKER summarized the results of the cooperative study on the determination in meat at the 5 $\mu\text{g/kg}$ level of four nitrosamines. The data indicated the possibility of a number of methods capable of detecting volatile nitrosamines at such levels in canned meat, but that independent confirmation of identity was necessary. A procedure involving the use of a new detector, available to only one laboratory, gave more precise results. An order of priorities was agreed upon by the European IARC Sub-Committee for additional food items to be studied cooperatively as a basis for an eventual manual on methods for nitrosamine analysis in foods. The Commission recommended these to be continued.

(ii) Dr. KUBACKI submitted a report on a literature survey of non-volatile nitrosamine analytical procedures. All the methods available at present were based on functional group analysis. One had the advantage that it did not require clean-up of sample extract. The survey would be used to establish priorities for further studies in this area. The Commission recommended this to be continued.

(iii) Dr. GRIMMER reported on the results of the collaborative study for polycyclic aromatic hydrocarbons by a method using GLC. The studies, using spiked samples of sunflower oil and meat, yielded results supporting recommendation for adoption of the procedure as a screening method for all PAH

in these products. In the absence of independent confirmation of the indicated hydrocarbons this procedure was not adequate for recommendation as a reference method. Accordingly, the earlier studied Howard multi-component procedure was recommended for adoption as reference method for hydrocarbons in meat. Dr. KUBACKI presented a brief report on a simpler modification of the Howard procedure in relation to the sample treatment, extraction, clean-up and separation steps in its application to cereals. His report included also some data on alternative use of GLC in conjunction with the modification.

Procedures utilizing gas chromatography without specific confirmation of indicated hydrocarbons could be used only as screening methods. Results must be confirmed either by application of Reference Method or by use of mass spectrometry.

(iv) Dr. GRIMMER reported a preliminary study of a procedure for determination of polycyclic and N-containing polycyclic aromatic heterocyclics which had indicated that some of the carcinogenic heterocyclic compounds could also occur in smoked herring. He proposed to extend the study to fruits and vegetables as the next step in the development of a recommended procedure. He also planned to identify about twenty unknown compounds and continue work on mass spectrometric confirmation.

(v) Dr. WASSERMAN presented a report on a collaborative study in the United States on a modified AOAC procedure for nitrites in meat. The data showed that the procedure met the AOAC criteria for an official method and adoption of the procedure was being recommended to AOAC. The Commission also recommended the procedure to IUPAC as a candidate method for collaborative study in the establishment of an international reference procedure.

(vi) Dr. POUILLAUDE indicated no additional information to add to his 1974 survey report on methods for individual antioxidants in foods. The report was recommended for publication as a supplement to the 1971 IUPAC Survey of Methods for Some Food Additives.

(vii) Dr. KUBACKI submitted a 1974 report on methods in current use for determining Multi-Antioxidants in Foods. On the basis of the scope of usage of antioxidants he would prepare a literature survey of procedures for determining multi-antioxidants in food which would be completed in the next three months. In addition, he identified BHA, BHT, TBHQ and appropriate gallates as comprising adequate scope for a multi-antioxidant procedure

development. This development would follow in cooperation with the Oils and Fats Section.

(viii) No report was received on procedures for the determination of urethane developing from diethylpyrocarbonate added to beverages.

(ix) On behalf of Dr. SOMERS, a report was prepared by Dr. CONACKER and Dr. PAGE of the Canadian Food and Drug Directorate to update and expand Dr. SOMERS' earlier report on available methods for synthetic and artificial sweeteners in foods. It was recommended that this report be published as a supplement to the 1971 IUPAC report.

(x) No report had been received on the project for controlling low molecular weight fractions in food grade carrageenin. Mr. MACDONALD had questioned the adequacy of the Food Chemicals Codex specification for that purpose. More recent information from the producer intended to support the adequacy of available tests to demonstrate absence of significant amounts, if any, of low molecular weight fractions from food grade carrageenan was not beyond dispute. No additional development work was planned pending further evaluation of the relative importance and priority of alternative methodology for controlling low molecular weight fractions in carrageenan.

COMMISSION ON FOOD CONTAMINANTS (VI.1.2)

2–5 September 1975

Present: Dr. K. KOJIMA (Chairman), Dr. K. OHNO (Secretary), Dr. A. D. CAMPBELL, Dr. P. KROGH, Dr. P. L. SCHULLER, Mr. M. V. TRACEY (Titular Members); Prof. G. BILLEK, Dr. M. JEMMALI, Dr. P. S. STEYN (Associate Members); Prof. W. KRÖNERT, Mr. F. BRO-RASMUSSEN (National Representatives); Prof. A. RUTKOWSKI (Observer, National Representative for Food Section).

1. Minutes of Previous Meeting

The minutes of the meeting held in Warsaw on 25–27 July 1974 [see *Inf. Bull.* No. 49 (March 1975), pp. 43–47] were approved.

2. Publications

Dr. KOJIMA reported that the following had been published as Technical Reports appendices to the *Inf. Bull.*:

- No. 9 Recommended Method for Aflatoxins in Copra, Copra Meal and Coconut.
- No. 10 Development of a Method to Evaluate Sampling Plans used to Estimate Aflatoxin Concentration in Lots of Shelled Peanuts.
- No. 11 Collaborative Study of the Determination of Aflatoxin M₁ in Milk.

As for the report of the second IUPAC Symposium on Mycotoxins in Food, July 1974, the Commission agreed to publish it as a special issue of the *Acta Alimentaria Polonica*, in view of the delay in publication as explained by Prof. RUTKOWSKI.

3. Cooperation with International Organizations

(i) Dr. KOJIMA reported that he and Dr. MARCUSE had attended as official representatives of IUPAC the 18th Session of the Joint FAO/WHO Expert Committee on Food Additives, Rome, 4–13 June 1974, and submitted the report to the IUPAC Secretariat.

(ii) Dr. KOJIMA reported that the FAO/WHO Expert Consultation to Identify the Food Contaminants to be monitored and to recommend sampling plans and methodology was held in Rome, 7–11 October 1974. In this connection Dr. KOJIMA visited FAO in his capacity as the Chairman of

Commission in July 1974 to ensure good cooperation with FAO/WHO, and Dr. KROGH had been invited to the meeting.

(iii) Dr. KOJIMA reported that he had been asked for comment through the Chairman of Section on 'Methods of Determination of Chloride in Food' being a part of the FAO/WHO Food Standards Programme in March 1975, and had sent comments.

(iv) Dr. KOJIMA reported that he had been asked to comment through the Chairman of Section on 'Draft International Standard ISO/DIS 3709, Phosphoric Acid for industrial use (including foodstuffs) – Determination of oxides of nitrogen content – 13,4-xylene photometric method', in July 1975, and had sent comments.

4. Relation with other Sections and Commission

Dr. KOJIMA reported that comments from Prof. BILLEK and Dr. COLES on the report of Methods for Destruction of Organic Matter prepared by the Commission in Microchemical Techniques and Trace Analysis (V.2) were sent to the Commission.

At the Joint Meeting of the Section with the Section on Pesticides, it was requested to study the background level of bromine, in connection with the residue of pesticides containing bromine. Dr. KOJIMA agreed to look for the existing data.

5. Progress Report on Projects

Determination of Mercury in Food. Having considered the result of the study reported by Dr. GUTHENBERG, the Commission agreed to publish the revised method as a standard method of IUPAC.

Cadmium in Food. It was decided not to publish the review paper on cadmium prepared by Dr. COLLINGS.

Determination of Lead and Cadmium in Food. Because of the decision of the last meeting in Warsaw, the collaborative study pending difficulties in the recovery of cadmium was stopped. An interim report prepared by Dr. OHNO on the results was circulated to the participants and members for comments. Dr. SCHULLER prepared a paper 'Some Reflections on the Collaborative Study' discussing the result and comments, and this was circulated to members for comments. Along with these comments from the participants and members, Dr. USHER proposed a dry ashing procedure, and this was circulated to members for comments.

The Commission discussed the present situation and decided the future action as follows:

- (i) The existing IUPAC method (1965) had been studied in order to update it.
- (ii) As the result of a study including a collaborative test in applying the wet digestion procedure it was found that it would be advisable to add some detailed information or caution on the procedure, and to present the scope of the method more specifically.
- (iii) The study of the method for the determination of lead and cadmium including the wet digestion procedure should be continued to facilitate the final draft for the revision of the existing method.
- (iv) In connection with the dry ashing procedure the proposed method by Dr. USHER was considered. This method should be elaborated based on comments from members, and be studied collaboratively or cooperatively to prepare a revised procedure of the present IUPAC one. The scope of the application relating kinds of foodstuffs and contents of lead and cadmium should be considered too.

Procedure of Collaborative Study. In connection with the collaborative study of lead and cadmium, Dr. HORWITZ of US-FDA had sent a critical comment on the procedure of the collaborative study. The Commission agreed to ask the Section to consider the establishment of a guideline or principle on the procedure of collaborative studies, as an important basic problem relating to IUPAC activities and others, bearing in mind problems such as avoiding duplication with other study, thorough preparation of a method to be used, cross-check of the method by more than two laboratories, number of laboratories to participate, number of samples to be tested, selection of suitable samples and experienced analysts in the area. Dr. BRO-RASMUSSEN agreed to supply the relevant information from Nordic countries. Dr. STEYN called attention to the possibility of cooperation of laboratories which had not participated in these studies, perhaps by getting information from the National Adhering Organizations of IUPAC.

Determination of Copper in Food. Dr. SCHULLER distributed his paper on the subject giving an overview of the situation, including the comments received on the proposal by members. It was decided to prepare a final draft proposal which should be circulated to the members of the Commission for their approval prior to publication. It was pointed out that the proposed method had included the recommendations made by the Metallic Impurities in Organic Matter Subcommittee of the Analytical Methods Committee (UK)

and because the method had been studied collaboratively by AMC there was no need for IUPAC to carry out a new one.

Determination of Selenium in Food. A paper on a method of determination of selenium to be possibly elaborated as a standard method of IUPAC, along with the brief review of methods of the determination, prepared by Dr. COLES on the request of the Commission, was distributed recently, and the Commission decided to ask for comments of members by the end of 1975. Although there were comments pointing out difficulties in having a standard method, the need of the method was recognized and the Commission decided to continue the study.

Determination of Fluoride in Food. The Commission recognized that a report was under preparation by Prof. TRUHAUT and would be circulated at the beginning of 1976.

Collection of Information on Food Contaminants derived from Food Packaging and Containers. Recognizing the importance of the problem of vinyl chloride, the Commission decided that members be asked to comment on the working paper prepared by Prof. BILLEK on the contamination of food by vinyl chloride, including some toxicological aspects, by 15 October 1975 and the revised paper be sent to IARC as an information from the Commission. Prof. BILLEK agreed to prepare a subsequent working paper on PVDC.

Nesheim Procedure for Determination of Ochratoxin. The Commission decided to publish the Nesheim procedure as an IUPAC Technical Report. The latest procedure includes ochratoxin A and B but excludes the ochratoxin esters because they do not occur as natural contaminants of foodstuffs.

Shotwell Procedure for Determination of Aflatoxin. It was recognized that the Shotwell procedure for aflatoxin in corn (also applicable to soyabean) was being written up for publication as an IUPAC Technical Report.

Publication of a Compilation of IUPAC Recommended Methods. The Commission recognized the need for publication of a compilation of methods of determining mycotoxins, heavy metals and other contaminants which had been produced and recommended by the Commission.

Romer Procedure for Determination of Aflatoxin. The Commission was satisfied with the collaborative study conducted on the Romer column detection method (five of the members were collaborators) and decided that it could be useful in the production and quality control of foodstuffs. It was approved as an IUPAC recommended procedure. A statement to this effect

with pertinent references [ROMER, T. R. and CAMPBELL, A. D., *JAOAC* 59, No. 1 (1976) and *JAOAC* 58, No. 2, 393–394, Sec. 26.A01-26.A08 (1975)] would be submitted for publication in the *Bulletin*.

Minicolumn Method for Determination of Ochratoxin A. A collaborative study on the minicolumn method for determination of ochratoxin A in barley and mixed feed [*JAOAC* 58, 156–158 (1975)] will be organized by Dr. KROGH.

Method for Determination of Mycotoxin Residues in Meat. Methods for determination of aflatoxin residues in meat would be evaluated by members, and when the relevant method had been decided upon, a collaborative study on aflatoxin residues in meat (pigs, poultry) would be considered. After termination of the study, an IUPAC collaborative study on ochratoxin A residues in meat (pigs), using the IUPAC recommended TLC method or the best method available at that time, would be conducted. Dr. KROGH and Dr. JEMMALI agreed to take care of these projects.

Mycotoxin Formation during Shipment of Foodstuffs. In order to document the importance of this project, the Commission would obtain relevant information through members. The information was to include data on rejection percentages for aflatoxin contaminated peanut lots encountered at ports of importation in Denmark, Holland and Japan, as well as data on aflatoxin concentration in peanut meal imported into Japan measured before and after the shipment. Simultaneously appropriate steps would be taken to create interest in the project by FAO or UNEP in an attempt to make funds available. When the financial basis was established the project would be launched.

International Mycotoxin Check Sample Series. A committee made up of representatives from throughout the world would be appointed to oversee, advise and assist IARC in their conductance of the programme. The first series under this new sponsorship – to be carried out in the first half of 1976 – would be on peanut, peanut products and corn samples. Close liaison would be maintained with the Food Contaminants Commission. Funding, other than that of IARC, would be from seven or eight sources. It was expected that the funding base would expand as the programme proceeded.

Method for Determination of Aflatoxin M_1 in Dairy Products. The method for determination of Aflatoxin M_1 in dairy products by STUBBLEFIELD and SHANNON would be sent to members for review and consideration for acceptance as an IUPAC method.

Dr. SCHULLER would undertake a collaborative study comparing the new Dutch method with the STUBBLEFIELD method using naturally contaminated cheese as test material. TLC plate and chemical derivative confirmation would be included.

Sampling Plans for Mycotoxin Analysis. Dr. CAMPBELL reported that he was Head of a committee in the United States to prepare a handbook on the subject, and individuals with direct knowledge and access to information on commodities of interest would be invited to prepare pertinent sections of the book.

Mycotoxin Analytical Standards. Dr. CAMPBELL would attempt to have a report prepared for the Commission giving sources, specifications and details for preparation of mycotoxin analytical standards. He also reported that Mr. SPHON and Dr. POHLAND had prepared an US-FDA publication of mass spectrographic data for a number of mycotoxins, and this would be available upon request to Dr. A. E. POHLAND (HFF 146, FDA, 200 C St. SW, Washington DC 20204, USA). This would be revised by updating with additional data in 1976. Dr. SCHULLER agreed to undertake a collaborative study on mycotoxin analytical standards.

Cooperation with FAO and WHO on Mycotoxin Problems. FAO and WHO were currently being informed about the activities of the Commission. Dr. SCHULLER and Dr. KROGH had acted as consultants on aflatoxin in the fall 1974, and Dr. JEMMALI and Dr. KROGH had been asked to act as consultants during a FAO organized workshop on aflatoxin, to be held in Mysore, India, in March 1976.

3rd IUPAC Symposium on Mycotoxins in Foodstuffs. It was planned to organize a 3rd Symposium on Mycotoxins in Foodstuffs, following the meeting of the Commission in 1976. The Symposium lasting 2–3 days would take place in Paris – organized by Dr. JEMMALI. The Commission therefore decided that Paris be the place for the next meeting of the Commission.

Detoxification of Aflatoxin-contaminated Foodstuffs. The Commission considered a working paper on detoxification of aflatoxin-contaminated foodstuffs by Dr. JEMMALI, and it was decided to pay considerable attention to this important aspect. As a consequence, detoxification would be a major item on the programme of the 3rd IUPAC Symposium on Mycotoxins in Foodstuffs.

Multi-analyses Methods for Mycotoxins. The Commission considered a

working paper on the subject by Dr. STEYN, and it was decided that no action could be taken at the moment. Dr. STEYN would act as a referee on the subject.

Single-cell Protein. The proposal made by the Chairman of the Section at the Joint Meeting with the Fermentation Section to make up a working group was recognized as an adequate approach to handle the problem, and the Commission agreed to propose the inclusion of Dr. LITTLEHAILES, Mr. TRACEY and Dr. OHNO in the group.

Use of Animal Waste for Animal Feed. Dr. CAMPBELL explained that the US Government was preparing to issue a plan in the Federal Register on this matter. This would be circulated to members for information, and the future action to be taken by the Commission would be considered.

6. New Project Proposals

The Commission was aware of the growing hazard from marine toxins as contaminants of seafoods, especially algal toxins (phycotoxins). As a first step of future activity in this important field Dr. KROGH would prepare a working paper on methodology for saxitoxin in shellfish, to be circulated to members.

Dr. STEYN agreed to prepare a working paper on toxins produced by fungi for consideration as a new project of the Commission.

SECTION ON FERMENTATION (VI.2)

3–5 September 1975

Present: Dr. S. KINOSHITA (Chairman), Dr. A. E. HUMPHREY (Vice-Chairman), Dr. J. C. HOOGERHEIDE (Secretary), Dr. R. J. ERTOLA, Prof. A. FIECHTER, Prof. S. J. PIRT (Titular Members); Prof. H. DELLWEG, Dr. B. M. LAINE, Dr. A. F. LANGLYKKE, Dr. F. PARISI (Associate Members); Prof. J. HOLLO, Mr. W. K. BRONN (National Representatives); Dr. M. K. EL-MARSAFY, Dr. R. WIESENACK, Secretary-General 5th IFS, Berlin (Observers).

1. In Memoriam

A moment of silence was observed to honour the memory of Dr. H. J. BUNKER, who had passed away on 8 August 1975. Dr. BUNKER was one of the pioneer members of the Section. His interest and contributions to the Section extended far beyond his active membership period (1963–71).

2. Minutes of Previous Meeting

The minutes of the meeting held in Vienna during 13–14 July 1974 [see *Inf. Bull.* No. 48 (October 1974), pp. 66–68] were approved.

3. Sponsorship of Symposia

Vth International Fermentation Symposium, Berlin, 28 June–3 July 1976. Prof. DELLWEG and Dr. WIESENACK presented a detailed report on the progress made during the past year. Prof. H. J. REHM (Münster) had been named Chairman of the scientific programme. At least 450 papers were expected to be presented, divided over twenty-seven sessions; each session was the responsibility of a convener. The combined sessions cover the entire field of fermentation activity. A second circular was distributed in June 1975 and a final one was planned for January 1976. An IUPAC Advisory Programme Committee had worked closely with the Programme Committee of conveners.

An independent specialized yeast symposium with as subject 'Yeasts for Industrial Use' was being organized as part of the 5th IFS (Dr. S. WINDISCH, Chairman).

VIth International Fermentation Symposium, 1980. A committee with Prof. HUMPHREY as Chairman was nominated to investigate and solicit offers

from National Organizations willing to organize future International Fermentation Symposia. An unofficial invitation to hold the VIth IFS in India had the support of (i) Association of Microbiologists of India; (ii) Indian Institute of Chemical Engineers; (iii) Indian Drugs and Pharmaceuticals Ltd.; (iv) Central Drug Research Institute; (v) Indian Institute of Technology. An official invitation might be expected soon from the Indian National Science Academy.

3rd International Symposium on Genetics of Industrial Microorganisms. A request was received from Dr. D. PERLMAN, Organizing Chairman of above Symposium for an IUPAC co-sponsorship. The Symposium would be held during 5–9 June 1978 at Madison (Wisconsin), USA. The request was fully endorsed by the Section and all necessary steps would be taken by the Secretary to request Bureau approval of IUPAC co-sponsorship with the support of our Section.

4. Studies on the Properties of Yeast

An official request was received from the Commission of European Community (ECC) by the ICC working group 30 to establish standards and to develop standard methods for determining whether a yeast (fresh or dry) might be acceptable for baking purposes. Such standards and methods were intended to be introduced in EEC directives. The ICC group 30, in close cooperation with our Section (Dr. PARISI is Chairman of the group and coordinator with our Section) had accepted this request and at a recent COFALEC meeting it was decided to start an international survey with cooperating laboratories using two different evaluation methods. A sub-committee from among Section Members was nominated (PARISI-BRONN-HOOGHEIDE) to evaluate results of the survey prior to submitting them to the Section, ICC group 30 and eventually to the EEC.

5. Education in Biochemical Engineering

The purpose of this project to establish guidelines for university curriculae, leading to the degree of bio-engineer. At present such curriculae varied so widely that it was felt that internationally accepted minimum standards for the basic education of a bioengineer should be established. During the past year a report was published on this project (*Inf. Bull.* No. 48, October 1974) and distributed worldwide to Institutes and educators engaged in biochemical engineering education.

6. Microbiological Aspects of Effluent and Water Purification

A joint meeting with the Water Quality Section was held. Eleven members and two observers were in attendance. Prof. PIRT chaired the meeting and Dr. FREYSCHUSS co-chaired the session. A proposal was made to sponsor a Symposium on 'Microbiological Processes in Industrial Waste Water Treatment' to be held at Prague during 18–20 January 1977 at the Institute of Chemical Technology. An organizing committee was appointed consisting of Drs. S. J. PIRT, A. HUMPHREY, J. TAKAHASHI, R. PEARSON, K. TROBISCH and P. GRAY (Chairman). Dr. GRAU was requested to assume responsibility for obtaining official approval of IUPAC sponsorship. A tentative budget would be submitted and modest IUPAC help would be requested to finance the Symposium.

7. SCP Standards for Protein of Microbial Origin

During the past year the *ad hoc* Advisory Committee of the Section published its first report entitled: Proposed Guidelines for Testing of SCP destined as major Protein source for Animal Feed (Technical Report No. 12 to *Inf. Bull.*). The report was widely distributed to industrial firms interested in SCP production, nutritionists, toxicologists and government agencies charged with approval of SCP for sale in their respective countries.

Due to the extreme diversity of SCP expected in the future as a result of the use of diverse types of raw materials and microorganisms as well as different technologies during isolation additional recommendations were required dealing with such specific raw materials and organisms and the specific hazards involved by using such processes. Literature study and intensive contact with industries intending to use such novel processes for SCP production were required in order to be able to prepare future Addenda to Technical Report No. 12, dealing with such specific processes.

As examples of such novel processes, already in an advanced stage of development, must be mentioned: bacterial SCP prepared with methanol or methane as substrate and fungal protein prepared with purified sulphite waste liquor as substrate. This required additional methods for analysis and a constant review and modernization of previously recommended methods for which our Committee was highly dependent on continued cooperation with the members of IUPAC's Food Section.

8. Glossary of Terms and Symbols in Fermentation Literature

Mr. BRONN submitted an outline of suggested definitions, terminology and

symbols to be used in fermentation technology. The outline had taken into account already accepted symbols and terminology in physical chemistry. It was extensively discussed and a committee was nominated, chaired by Mr. BRONN, to study, extend and coordinate the recommendations for Section approval at the next meeting. Also a round table discussion on this subject was planned during the 5th International Fermentation Symposium at Berlin in 1976.

9. Other Projects

Microbiological Aspects of Food, Feed and Energy Production from Natural Resources and Agricultural Waste. A lively discussion was held on the possibilities of converting waste products, e.g. those of cellulose nature by microbiological means, to useful products such as sugars, alcohol, SCP and others. As a first approach and as basis for further decisions on this subject at our next meeting Dr. GHOSE's offer to prepare a survey of the possibilities of microbiological and enzymatic cellulose degradation was greatly appreciated.

Microbiology Newsletter. The possibility of producing a *Newsletter* on items of international interest to microbiologists was discussed. The subject would be put on the agenda for the next Section meeting. Members were requested to collect such items in their respective areas, such as meetings, symposia, new production plants and processes, political attitudes on microbiological developments such as SCP, interesting articles, etc., suitable as basis for decisions to be made at Commission's next meeting.

10. Future Meetings

Next Section Meeting (in 1976) would be at Berlin in conjunction with the 5th IUPAC sponsored IFS, tentatively on 26 and 27 June. The 1977 meeting would be in conjunction with the next IUPAC conference, tentatively planned for Poland.

11. Membership

The following Officers and Members were elected (the list was subsequently approved by Division Committee and Bureau). Chairman: Prof. A. E. HUMPHREY; Vice-Chairman: Prof. H. DELLWEG; Secretary: Dr. J. C. HOOGERHEIDE; Titular Members: Dr. R. J. ERTOLA, Prof. J. HOLLÓ, Acad. I. MÁLEK, Dr. R. C. RIGHELATO, Dr. K. YAMADA; Associate Members: Dr. V. K. EROSHIN, Prof. A. FIECHTER, Prof. T. K. GHOSE,

Mr. B. M. LAINE, Dr. F. PARISI, Prof. S. J. PIRT, Dr. B. P. RALPH, Prof. G. TAKAHASHI; National Representatives: Ing. H. WUTZEL (Austria), Mr. W. K. BRONN (FRG); Corresponding Member of Division Committee: Dr. A. F. LANGLYKKE.

SECTION ON OILS AND FATS (VI.3)

3–6 September 1975

Present: Drs. H. J. VOS (Chairman), Prof. C. PAQUOT (Secretary), Dr. H. BRÜSCHWEILER, Prof. E. DELVAUX, Dr. N. D. EMBREE, Dr. J. GRACIAN TOUS, Mr. A. T. MØLLER, Drs. J. C. VAN DER WEEL (Titular Members); Prof. T. ASAHARA, Ing. C. CAROLA, Prof. M. NAUDET, Mr. A. PETERSEN, Prof. A. RUTKOWSKI, Prof. H. WESSELS (Associate Members); Mr. S. B. LINTZ CHRISTENSEN, Dr. D. FIRESTONE, Prof. M. GASSIOT-MATAS, Dr. T. HASHIMOTO, Dr. A. HAUTFENNE, Drs. P. HENDRIKSE, Prof. J. HOLLÓ, Dr. E. KURUCZ, Dr. Ö. LEVIN, Dr. P. R. E. LEWKOWITSCH, Prof. R. MONACELLI, Dr. R. OHLSON, Dr. M. TEUPEL, Dr. H. WENDT, Dr. K. WILLIAMS (National Representatives); Dr. J. BEARE ROGERS, Prof. E. TISCORNIA (Observers).

1. Minutes of Previous Meeting

A report of the meeting held in Jablonna (Poland) from 28 to 30 August 1974 had been published in *IUPAC Inf. Bull.* No. 49 (March 1975), pp. 54–57. A more detailed document (Procès-Verbal des Réunions de Jablonna) had also been distributed to Members by IUPAC Secretariat on 17 December 1974. The minutes were adopted without any comment.

2. Membership

Titular Members. Dr. N. D. EMBREE retired as Titular Member and would continue his work as National Representative. The participants agreed that the President of Applied Chemistry Division be asked to approve of the nomination of Dr. D. FIRESTONE as Titular Member (to replace Dr. EMBREE) and to seek permission from the Bureau for Drs. H. VOS to continue as Chairman until 1977.

Associate Members. It was agreed that Division President be requested for his approval to have the term of office of all the Associate Members extended for a period of two years.

National Representatives. Dr. G. BALESTRINI (VI.3.2), Prof. P. DESNUELLE (VI.3.2), Prof. F. KUMMEROW (VI.3.1) and Dr. S. TOMIYAMA (VI.3.2) had expressed their wish to resign their function as National Representatives, respectively of Italy, France, USA and Japan. The Members approved the nomination as National Representatives to the Section (and its two Commissions)

by the relevant Adhering Organizations of Dr. D. CHOBANOV (Bulgaria) (VI.3.1), Dr. E. KURUCZ (Hungary) (VI.3.2), Dr. W. LINK (USA) (VI.3.1). It was also agreed that approval be asked for the nomination of Prof. E. TISCORNIA and Dr. N. D. EMBREE as National Representatives of Italy and USA to Commission VI.3.2.

3. Chairman's Report

The Chairman informed the participants on the latest development regarding the publication of the 4th Supplement to the 5th edition of the IUPAC *Standard Methods for the Analysis of Oils, Fats and Soaps in Pure and Applied Chemistry*; reprints, convertible to loose-leaf form, will be purchasable from the IUPAC Secretariat. (Note added in proof: The 4th supplement would now be published separately to *Pure and Applied Chemistry* by Pergamon Press, the new official publisher to IUPAC). The 6th edition would be published in *Pure and Applied Chemistry*.

The new system of Working Groups had proved to be quite satisfactory indeed; the responsibilities were now more divided within the Section and its two Commissions. The Chairman emphasized that the work was performed by Members on a voluntary basis with very good results and that any unnecessary restriction that could hamper this enthusiastic collaboration should be avoided.

One of the most important problems discussed in the Report had reference to the new Statutes and By-laws, which would be considered by the Council at the end of Conference. If they came into force, they certainly would not be without effect on the further development and activities of the Section, the name of which would be changed to Commission on Oils, Fats and Derivatives (as already adopted last year at the Jablonna meeting, since 'Oils and Fats' alone would be too vague). With regard to the number of Titular Members (8) and Associate Members (not exceeding normally the number of Titular Members but might be increased to 12) there would be no difficulty. However, problems could be expected in case of the National Representatives: each Commission could have only one National Representative for each country. This question should be considered in close concert with Applied Chemistry Division.

At the end of his Report, the Chairman gave a brief summary on the contacts between the Section and the other national and international organizations dealing with standardization of methods of analysis in the field of oils, fats and their derivatives.

4. Work Program 1974–1975

The results of the activities of all the Working Groups (WG), except WG 9, were discussed. It was decided that the 'Determination of the Melting Range of Fats' (WG 1) be withdrawn from the Program, since the results of the collaborative test of this and foregoing years were less satisfactory, and improvement could not be expected. In addition it was agreed that the activities of the other WGs be continued as part of the Work Program 1975–1976. The new Chairman of WG 8 (Emulsifiers) would be Dr. H. BRÜSCHWEILER.

The following are the work programs of the various Working Groups. The names of the Chairmen of WGs are given in parenthesis.

- WG 2 – Determination of Total Oxidized Fatty Acids (Prof. M. NAUDET)
- WG 3 – Determination of Tocopherols (Free and Esterified) (Drs. P. HENDRIKSE)
- WG 4 – Determination of Chlorinated Pesticides (Prof. E. DELVAUX)
- WG 5 – Determination of *cis-cis* Linoleic Acid (Dr. Ö. LEVIN)
- WG 6 – Determination of Fat Content of Oil Seeds by Wide Line NMR (Mr. J. -P. WOLFF)
- WG 7 – Heated Fats (Deep Fat Frying) (Prof. H. WESSELS)
- WG 8 – Emulsifiers (Dr. H. BRÜSCHWEILER)
- WG 10 – Derivatives of oils and fats (Mr. A. MØLLER)

5. Work Program 1975–1976

It was decided that, besides the already agreed continuation of the activities of the above-mentioned WGs, study be made of the following items and to that end working groups be established:

- WG 11 – Determination of Total Fat Content of Margarine (Prof. M. NAUDET)
- WG 12 – Determination of Plastic Polymers (e.g. polyethylene) in Oils and Fats (Drs. J. van der WEEL)
- WG 13 – Determination of Plastic Based Contaminants (except polyethylene) in Oils and Fats (Dr. Ö. LEVIN)
- WG 14 – Revision of Method II.D.5: Determination of Unsaponifiable Matter (Prof. M. NAUDET).

In addition, some other problems would be investigated by the Section in the next period, however, without establishing a corresponding Working Group. The following items were considered:

- Revision of some details in the text of Method II.D.1 (Acid value), study at the request of ISO (Drs. H. VOS).
- Comparative study on the possible use of thermoelectric couple instead of thermometer to determine the cooling curve of fats (Method II.B.5), at the request of OICC (Drs. H. VOS).

A request had been received from ISO/TC 91, 'Surface Active Agents', to study the problem regarding the 'Sampling of Soaps'. However, it was decided that this item should not be considered by the Section, but that it should be handed over to CIA of the CID (Comité International des Dérivés tensio-actifs).

6. Publications

The Secretary gave the following information:

(i) The 4th Supplement of the 5th Edition of the Oils and Fats Section's *Standard Methods of Analysis* would consist of nineteen methods. The final French texts of all the methods in question had already been drawn up; at the time of the Madrid meeting the English texts of eighteen methods were available. A number of the complete (French and English) texts had already been sent to the IUPAC Secretariat during the past year. IUPAC Secretariat would be supplied with the texts of *all* the methods concerned before October 1975 'for further action'; it was hoped that the relevant Supplement would be published at the end of this year.

(ii) A 6th edition of the *Standard Methods of Analysis* was in course of preparation as main part of the activities of Working Group 9.

After a lengthy discussion, it was decided to adopt the Secretary's proposal with regard to a more rational classification and numbering of the standard methods, which would also permit the incorporation of new methods without difficulty. The presentation (drawing up) of each text would be slightly modified in accordance with the directions given in Recommendation ISO R 78.

7. Date and Place of Next Meeting

The Danish delegation invited the Oils and Fats Section and its two Commissions to meet in Denmark, near Copenhagen, from 8 to 11 June 1976.

Note: At the end of the 28th Conference, the Council adopted the new Statutes and By-laws. Consequently, the Oils and Fats Section (VI.3) and its two Commissions (VI.3.1 and VI.3.2) would now continue their activities

as "Commission on Oils, Fats and Derivatives" (VI.4) of the Applied Chemistry Division.

SECTION ON PESTICIDES (VI.5)

2, 3 and 6 September 1975

Present: Dr. H. FREHSE (Vice-Chairman), Dr. K. R. HILL (Secretary), Dr. P. C. KEARNEY, Dr. J. MIYAMOTO, Prof. P. E. KOIVISTOINEN, Prof. G. WIDMARK (Titular Members); Dr. V. BATORA, Dr. Ch. RESNICK (Associate Members).

1. Minutes of Previous Meeting

The minutes of the last meeting, held in Jealott's Hill Research Station, Bracknell, UK, from 30 September to 4 October 1974 [see *Inf. Bull.* Nos. 50/51 (November 1975), pp. 15–17] were adopted.

2. Matters Arising from Minutes

(i) Further correspondence was received from the Organizing Committee of the 2nd Pesticide Chemistry Congress (IUPAC), Tel Aviv. The Section fully concurred in and endorsed their suggestion that a pesticide chemistry research fund be established and known as the Henry Hurtig Memorial Fund. The Section further agreed to give advice on the technical and scientific aspects of the disposition of the interest accruing from the fund if asked by such Trustees of the Fund as were established.

(ii) At the last meeting it had been agreed to pursue further efforts to publish the lengthy Commission reports in *Residue Reviews*. Dr. FREHSE reported that, as a result of further communications, it might be possible to publish full reports and appendices.

3. Liaison with International Organizations

(i) The report of the 55th Session of WHO in Geneva was noted.

(ii) The problem of future coordination of Plant Protection Congresses and IUPAC Pesticide Congresses was discussed, noting that it had been recommended that the 9th International Plant Protection Congress in USA be moved back to 1979. The Section further noted that in the past a member of the Section (Dr. HURTIG) had also been a member of the Plant Protection Organizing Committee, thus providing needed communication and coordination. It was hoped that such an arrangement could be reinstated in the near future. If such were the case, then Dr. H. GEISSBUHLER would be the

nominee to represent the Section.

(iii) The Section took note with considerable approval Resolution I from the minutes of the FAO *ad hoc* Government Consultation held in Rome in 1975.

(iv) FAO. Dr. E. TURTLE informed the Section that the Report and Monographs of the 1974 FAO/WHO-JMPR were in press and an information copy of the list of requirements had been provided to IUPAC in advance. The desirability of publishing a list of the compounds on the agenda well in advance of future JMPR meetings was agreed. Dr. TURTLE reiterated the value to the JMPR in receiving summaries and recommendations from IUPAC as representative of international opinion.

(v) CCPR. Dr. GREVE gave a report on the last meeting of the CCPR held in March 1975, and provided thirty copies of an abstract of their accepted methods of analysis for pesticides at Step 9 of procedure. The cooperation of the Commission on Pesticide Residue Analysis of IUPAC was acknowledged with appreciation.

(vi) CEE. Information was received that five methods for organochlorine and organophosphorus compounds were under collaborative study. The Section and Commission would continue to send copies of their minutes to CEE.

(vii) COMECON. Dr. FREHSE reported that Dr. ABBOTT had invited an Observer to attend Section meetings.

(viii) AOAC. Dr. HILL informed the Section that he had given a brief report of our 1974 meeting to the AOAC at their October meeting and would do so again this year. The need for more extensive preliminary testing and evaluation of analytical methods proposed by IUPAC for collaborative study involving AOAC was expressed.

(ix) EPPO. Because no observer was able to attend this meeting, the Section proposed to send a report to Dr. MATHYS.

(x) ICSU-SCOPE. Prof. WIDMARK indicated that he would have more time in the future to devote to activities of SCOPE if desired; the Section so indicated with approval.

(xi) CIPAC. The Section proposed to offer its services in connection with the analysis of residues.

4. Membership

(i) In response to requests for National Representatives to the Commissions, the Section arrived at the consensus that such representation would not be

desirable due to the following limitations: (a) Time — the length of meetings were already undesirably long due to the heavy work load. Additional participants would unduly interfere with the conduct of the meetings; (b) Space — the Commissions must meet on even-numbered years to carry out their programmes. Such meetings were held by the invitation of sponsoring organizations at locations which could often not provide the additional hotel and/or meeting space necessary for an enlarged group. The Section fully appreciated the high interest in pesticides among national delegations, however, for this reason, the Commissions would expect to have an unusually large number of representatives who would be impossible to accommodate. The results of the deliberations of the Commissions were public knowledge since the proceedings were published in *Comptes Rendus* and summaries in the *Journal of the Association of Official Analytical Chemists*.

(ii) In view of the unresolved future status of Sections within the Applied Chemistry Division, the Section elected the following Commission Members to serve either as a Section or a Coordinating Committee: Dr. H. FREHSE (Chairman), Dr. P. C. KEARNEY, Dr. R. GREENHALGH (new), Dr. J. MIYAMOTO, Prof. G. WIDMARK, Dr. V. BATORA (new), Dr. H. GEISSBUHLER (new), Mr. M. J. EDWARDS (Secretary) (new) (Titular Members); Dr. Ch. RESNICK, Prof. P. KOIVISTOINEN, and Dr. K. R. HILL (Associate Members).

5. International Pesticide Chemistry Congresses

(i) Zurich Congress (July 1978). Dr. GEISSBUHLER gave a progress report on arrangements for the 4th Congress and distributed copies of the First Circular. The Scientific Program Committee had made excellent progress in organizing and outlining a program format and made available a proposed timetable for main topic areas. A plenary session on 'World Food Production' was planned. The possibility of holding 'Postal Sessions' in lieu of workshops was discussed.

(ii) 1982 Congress. Dr. MIYAMOTO reported on further progress in possible arrangements for holding the 5th Congress in Japan. Dr. K. FUKANAGA, a previous Titular Member of the Commission on Terminal Pesticide Residues, was the 1st President of the Pesticide Science Society to be established in October 1976. The Society would assume responsibility for seeking further arrangements for the Congress.

6. Date and Place of Next Meeting

The next meeting of the Section (or Coordinating Committee) would be held in connection with the Commissions meeting on 13–17 September 1976 at Leverkusen, Federal Republic of Germany, by the kind invitation of Farbenfabriken Bayer.

COMMISSION ON TERMINAL PESTICIDE RESIDUES (VI.5.1)

3 September 1975

Present: Dr. K. R. HILL (Chairman), Dr. P. C. KEARNEY (Secretary), Dr. R. L. BARON, Dr. H. GEISSBUHLER, Prof. F. KORTE, Dr. J. MIYAMOTO (Titular Members); Dr. H. M. DEKHUIJZEN, Dr. N. DRESCHER, Prof. R. ENGST, Mr. G. E. MAYR (Associate Members); Dr. R. BATORA, Dr. M. J. EDWARDS, Dr. K. ELGAR, Dr. P. A. GREVE, Dr. S. G. HEUSER, Dr. P. E. KOIVISTOINEN, Dr. E. E. TURTLE, Dr. CH. RESNICK, Dr. G. WIDMARK (Observers).

1. Minutes of Previous Meeting

The minutes of the Eighth Meeting of the Commission, held at ICI Plant Protection Limited, Jealott's Hill Research Station, Bracknell, UK on 2 October 1974, had been published, together with Appendices, in *Inf. Bull.* Nos. 50/51 (November 1975), pp. 19–74. The minutes were accepted. (The minutes would also be published in *J. Assoc. Offic. Anal. Chem.*)

2. Matters Arising from Minutes

The chairman referred to the following matter: Arrangements had been made to publish the minutes and appendices of both the Commission on Terminal Pesticide Residues (VI.5.1) and the Commission on Pesticide Residue Analysis (VI.5.2) in *J. Assoc. Offic. Anal. Chem.* Dr. HILL had made arrangements for the minutes and appendices of the Munich Meeting, held in 1973 to be published in an early issue in 1976. The minutes of the Madrid Meeting, together with the appendices, would be published in *Comptes Rendus*.

3. Membership

The following future Membership of the Commission was agreed: Dr. P. C. KEARNEY (USA) (Chairman), Dr. R. GREENHALGH (Canada) (Secretary), Dr. R. L. BARON (USA), Dr. D. G. CROSBY (USA), Prof. R. ENGST (German Democratic Republic), Dr. H. GEISSBUHLER (Switzerland), Prof. F. KORTE (Federal Republic of Germany), Dr. J. MIYAMOTO (Japan) (Titular Members); Dr. H. M. DEKHUIJZEN (Netherlands), Dr. N. DRESCHER (Federal Republic of Germany), Dr. G. E. MAYR (Federal Republic of Germany), Dr. G. E. STILL (USA) (Associate Members).

4. International Liaison

- (i) Dr. TURTLE (FAO) called attention to the list of compounds for consideration at the 1975 Joint Meeting of the FAO Working Party and the WHO Committee of Experts on Pesticide Residues: Tentative Proposals of Secretaries of Joint Meeting, which had been circulated to the members by the Secretary. In developing information for future reports, it was requested that this list be kept in mind. This list included the following groups of compounds: Group I – Compounds suggested by the Codex Committee on Pesticide Residues and not previously evaluated by the Joint Meeting of Experts; Group II – Compounds listed in previous reports of Joint Meetings as due for re-evaluation in 1975; Group III – Certain compounds only partially evaluated at previous meetings for which it seemed likely that future progress should be possible in 1975; Group IV – Other compounds or problems submitted for evaluation and advice by FAO and WHO. In 1975 it was proposed to consider aldrin and dieldrin within this group; and Group V – Compounds for which re-evaluation were pending with dates having been specified previously. It was also reported that monographs of the JMPR, which list new needs, would probably be published later this year. It was also recommended that the agenda of the Commission should be published to show the needs for information for various pesticides.
- (ii) Dr. GREVE (CCPR) briefly described the activities of the Codex Committee on Pesticide Residues. He would be pleased to receive information on significant metabolites found in environmental samples. Interest in certain pesticide metabolites was increasing and might receive more attention in the future.
- (iii) No representatives of EEC or FAO/IAEA were present.

5. Organochlorine Compounds

Drs. KORTE and PORTER presented a report to the Commission on Terminal Residues of cyclodiene insecticides (Appendix I). ^{14}C labeled dieldrin did not break down in soils with incubation times up to 60 days under conditions which were conducive for microbial metabolism. There was no evidence for the conversion of dieldrin to aldrin. No apparent breakdown or radioactive dieldrin occurred in soils heavily contaminated with organochlorine compounds for many years and taken near the Shell Chemical plant in Denver, Colorado. The contaminated soil contained aldrin, plus dieldrin, and six other compounds similar to those reported by MATSUMURA *et al.* The

origin of these six products is unknown and might be by-products from the synthesis. Labeled ^{14}C dihydrochlordene-dicarboxylic acid has been synthesized and its metabolism studied in rats. About 46% of the excreted ^{14}C was the parent material. The dimethyl ester accounted for about 11.3% of the total. Metabolic studies were also reported for photodieldrin, isodrin, heptachlor, and chlordane.

Prof. KORTE reported on experiments with hexachlorobenzene (HCB) in rats and primates. Two metabolites found in the urine and feces were pentachlorobenzene and trace amounts of pentachlorophenol. Excretion patterns were studied in male and female rats receiving oral applications of 10 ppm HCB. After 40 days, 36% was excreted by the male rats and 30% by the females. Of that excreted, 95% was in the feces and 5% in the urine. Tissue analysis indicated that highest concentrations were found in fat (1-2 ppm), lymph (0.5 ppm), thymus gland (1-2 ppm), and liver (0.06-0.9 ppm). The distribution of metabolites in Rhesus monkeys fed HCB was as follows: feces, parent compound 27%, pentachlorophenol 0.2%, and in the liver, HCB 57%, pentachlorobenzene 43%, and trace amounts of pentachlorophenol. Dr. KEARNEY reported that hexachlorobenzene was extremely persistent in soils and 98% of the applied dose was recovered after one year. HCB was rapidly lost from forage surfaces by volatility and burning the forage did not accelerate the decontamination process.

Dr. HILL gave a short verbal report on recent progress on toxaphene metabolism. Four samples of toxaphene had been obtained for comparative mass spectral studies. Reference was also made to ongoing projects in Dr. CASIDA'S group at Berkeley, California, on isolating and characterizing some of the 170 components that comprise toxaphene. Some toxic fractions were being further evaluated at this time.

6. Organophosphorus Compounds

Dr. MIYAMOTO presented a joint report by Drs. MIYAMOTO and GREENHALGH to the Commission on terminal residues of chlorpyrifos-methyl and cyanophos in plant and mammalian metabolism studies (Appendix II). No oxygen analog of chlorpyrifos-methyl was found in milk when cows were fed treated silage. No residues of the parent compound could be found in milk, urine or feces one week after withdrawal from treated silage. Residues of cyanofenphos and cyanofenphos oxone in a 30-day feeding study were highest in fat and decreased in the order of fat>liver>kidney \cong muscle at the highest feeding rate of 50 ppm. Milk residues of cyanofenphos and

cyanofenphos oxone were below the limits of detection (0.002 ppm and 0.004 ppm, respectively). Other organophosphate compounds reviewed in mammalian metabolism studies included salithion, isoxathion, diazinon and methidathion. Terminal residues of parathion in plants included aminoparathion, *S*-ethylparathion, paraoxon and *p*-nitrophenol. The technical product, however, contained these products and thus formation under field conditions could not be assessed. Other phosphate insecticides examined in plant metabolic studies included salithion, dimethoate, phorate, quinalphos and leptophos.

Dr. ELGAR presented a brief report on dichloroacetaldehyde which is a metabolite of dichlorovos (Appendix III). A number of residue studies based on GLC with electron capture detection indicated that dichloroacetaldehyde was unlikely to occur as a significant residue following the use of dichlorovos.

7. Carbaryl and Other Carbamates

Dr. BARON presented a report to the Commission on the current status of terminal residues of carbaryl, carbofuran, mexacarbate and methiocarb (Appendix IV). It was pointed out that it was becoming increasingly more difficult to obtain new information on carbaryl. There were no new metabolites of carbaryl to report, but a number of reports on residues in cigarette smoke, feeding studies with sheep, rabbits and hogs, birds, and certain insects were discussed. A lengthy discussion ensued on the significance of *N*-nitroso carbamates and their significance other than under laboratory conditions.

Dr. MIYAMOTO presented a brief report on possible mutogenicity and carcinogenicity of *N*-nitroso derivatives of carbamates (Appendix V). Under laboratory conditions nitroso carbaryl was found to have a half-life at 37° in unbuffered aqueous media containing 20% methanol of 62, 320, 360, 67 and 1.5 minutes at pH 1, 3, 5, 7.2 and 9 respectively. In artificial stomach juice (pH 1.4) there was a small conversion (less than 2%) to the corresponding nitroso derivative. The Commission unanimously agreed that there was no evidence for any environmental significance of nitroso carbamates at the present time. Available information showed that these nitroso compounds were unstable and had only been isolated and characterized under laboratory conditions. It was further recommended that the Commission continue to follow the literature on nitroso compounds and discuss the subject again at next year's meeting.

8. Fumigants

No new information was presented on fumigants.

9. Fungicides

Dr. ENGST presented a report to the Commission on terminal residues of dithiocarbamate fungicides including maneb, zineb, mancozeb and metiram and its principal degradation product, ethylenethiourea (ETU) (Appendix VI). Extensive monitoring surveys were underway to ascertain the level of ETU contamination in commercial food crops. Cooking appeared to increase ETU residues in crops treated with bis-dithiocarbamate fungicides.

Dr. DRESCHER presented a report on terminal residues of dithiocarbamate fungicides with primary emphasis on ETU (Appendix VII). This report reviewed current literature on the chemistry, soil conversion, soil mobility, plant uptake, translocation and metabolism of ETU. A second report on the degradation of carbeneazim (BCM) in soils was also presented (Appendix IX). It was concluded that uptake of BCM residues by lettuce and radishes was negligible. A literature survey on ETU analysis, metabolism, residues and toxicology for the years 1964 to 1975 was also included. This survey was available from the Secretary on request.

Dr. BARON asked if there were tolerance recommendations for ETU in food commodities. Dr. TURTLE replied that there were residue limits but no tolerances and no AID's established at that time. It was pointed out that the chemistry of the dithiocarbamates was extremely complex and there appeared to be two pathways by which ETU was formed and possibly a third which required further investigation. Dr. KEARNEY recommended that ETU be given special attention at next year's meeting and that world authorities on ETU be asked to submit background papers to Dr. ENGST so that a special publication could be published by the Commission on this subject. Dr. ENGST agreed to undertake the organization and implementation of such a project. Dr. TURTLE commended the group for undertaking such a project since it would serve a valuable function in decision-making statements concerning ETU.

10. Herbicides

Dr. DEKHUIJZEN presented a report to the Commission on Terminal Residues of Herbicides (Appendix VIII). The metabolism of protham, siduron, monuron, dinitramine, butralin, isopropaline, and glyphosate metabolism in plants, animals and soils was reviewed. A number of the dinitroaniline

herbicides gave rise to benzimidazole derivatives. The question was asked, "What is known about benzimidazole derivatives and their persistence in soils?" Dr. KEARNEY replied that this subject had not been studied in great detail, but these materials plus quinoxalines and several other cyclic products were found in soils, usually in trace amounts. One of the most important reactions of many of the metabolites of herbicides was binding to soil components. Dr. HILL pointed out that the American Chemical Society recently sponsored a Research Conference on Bound and Conjugated Pesticide Residues in June 1975 at Vail, Colorado. The proceedings of this conference would be published in *Advances in Chemistry*, edited by Dr. D. D. KAUFMAN, and should appear early in 1976. It was recommended that bound residues might be a subject for a future topic in the Commission. Dr. GEISSBUHLER recommended that since the herbicide field was expanding so rapidly, future reviews should address themselves to critical issues in herbicide chemistry rather than an overview of major advances over one year.

11. Photodecomposition

A report was read to the Commission on 'Photodecomposition of Organophosphate Pesticides' by Dr. CROSBY (Appendix IX). The report covered some of the more important photochemical reactions of the organophosphate pesticides using parathion as a typical example. The report drew attention to the fact that photochemical reaction appeared to be responsible for a major portion of many persistent terminal residues. It also stressed the need for greater attention being focused on the non-biological breakdown products and their importance in the environment. The photodecomposition of cyanofenphos, parathion, pyrimitate, methidathion and fenitrothion were also discussed by MIYAMOTO and GREENHALGH (Appendix II).

12. Other Matters

The Commission discussed the question of including National Observers as part of the Commission's activities. It was agreed that National Observers would provide a broader working base for reviewing pesticide literature. The expansion on the group to include numerous National Observers, however, would present some major problems in scheduling and for local arrangements, particularly in the off-year meeting. The task of the Secretariat in handling the current minutes was difficult. To expand this function would require considerably more effort. Consequently, the Commission discouraged the

inclusion of National Observers at this time.

Dr. HILL discussed current and future projects and the concept of having a special project on ETU. He endorsed this project and encouraged Dr. ENGST to take an active role in contacting world leaders working with ETU. Prof. KORTE circulated a report entitled 'Scientific Basis for the Establishment of Threshold Levels and Dose Response Relationships of Carcinogens'.

13. Retirement of Chairman

The Commission thanked Dr. K. R. HILL for serving as Chairman of the Commission during a most important phase of pesticide development.

14. Date and Place of Next Meeting

The next meeting of the Commission would be held in Leverkusen-Bayerwerk, West Germany, 13-18 September 1976.

Appendix I: Terminal Residues of Cyclodiene Insecticides

MÜLLER *et al.* (1,2) found that dieldrin-¹⁴C was metabolized mostly to 12-OH-dieldrin and aldrin-*trans*-diol in mice, rats, rabbits, Rhesus monkeys, and chimpanzees. In all species the fecal excretion of unchanged dieldrin was high in the first 48 hours and then rapidly declined, probably due to the completed excretion of unabsorbed dieldrin. The urine samples contained only metabolites and no dieldrin. Regarding the ratio of the two major metabolites, the rat was very comparable to the primates; direct oxidation resulting in the monohydroxy metabolite was their common main metabolic pathway. In the mouse and rabbit the predominant reaction was opening of the epoxide to the diol. Metabolization rate was by far the highest in the mouse.

VOCKEL and KORTE (3) studied the action of microorganisms on dieldrin. Carbon-14 labeled dieldrin was added to microorganism cultures from a variety of sources including soils which had been heavily treated with aldrin, dieldrin and other chlorinated organic compounds. There was no detectable breakdown of dieldrin in any case with incubation times up to 60 days, even under stringent conditions in which microorganisms were allowed to absorb dieldrin in normal culture and then were transferred to a starvation culture in which they were dependent upon their own reserves.

Radiolabeled dieldrin was also incubated in appropriate suspensions of soil from the Shell Chemical Plant in Denver, Colorado. This soil had been heavily contaminated with chlorinated compounds over many years, including

aldrin and dieldrin. No apparent breakdown of the radiolabeled dieldrin occurred in 60 days. Since, even though this culture test showed no breakdown, it may be possible over the course of years in heavily contaminated soils to accumulate metabolites, the sample of soil was examined for the dieldrin metabolites previously reported by MATSUMURA *et al.* The sample contained 850 ppm of aldrin plus dieldrin and an aggregate of 150 ppm of the compounds (I) to (VI) shown in Chart 1. The substances (I), (II), (IV), (V) and (VI) were identified by comparison of mass spectra and chromatographic characteristics with those of authentic samples.

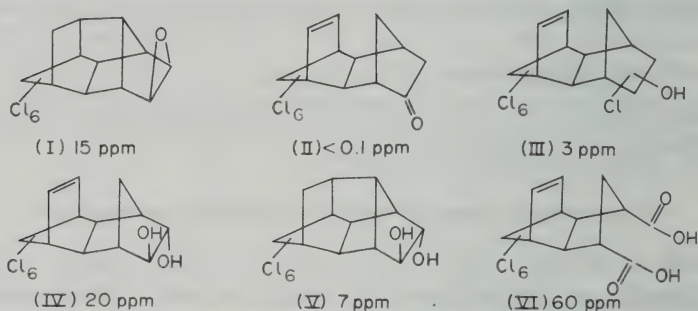


Chart 1

KILZER *et al.* (4) measured the distribution and metabolism of aldrin *trans*-diol in lettuce and soil. Four weeks after application of ^{14}C -*trans*-aldrin diol to head lettuce, virtually all of the radioactivity was recovered. This is in contrast to aldrin and dieldrin of which substantial portions of the radioactivity volatilize. The recovered radioactivity was about two-thirds unchanged *trans*-diol, about 25% hydrophilic metabolites, a small amount of an unidentified nonpolar material, and a very small amount of unextractable activity. About one-third of the hydrophilic fraction was dihydrochlordene-dicarboxylic acid (8% of total applied). At least three other components were present in the hydrophilic fraction but were not identified. Seven weeks after application of the *trans*-diol to soil, 91% of the radioactivity was recovered. Of the recovered activity, 10.4% was unchanged diol, 83.4% was hydrophilic metabolites, 3.2% was nonpolar compounds, and 3% could not be extracted with methanol or aqueous ammonia. The hydrophilic material was all dihydrochlordene-dicarboxylic acid. The nonpolar components were not identified.

LAY *et al.* (5) synthesized ^{14}C -labeled dihydrochlordene-dicarboxylic acid

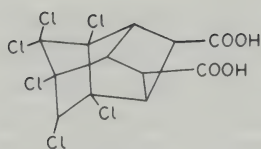
by alkaline permanganate oxidation of aldrin. The resulting labeled product was incubated with various centrifuge separated fractions of rat liver homogenate. Two principal products were the two isomers of mono-dechlorinated dihydrochlordene-dicarboxylic acid with one chlorine removed from the methano bridge. These were characterized by synthesis of authentic comparison standards and comparison of mass spectra of methylated products and chromatographic characteristics. A strongly hydrophilic component was also found which was not identified.

LAY *et al.* (6) also studied the conversion of dihydrochlordene-dicarboxylic acid in rats after intravenous injection. No significant difference was observed between males and females. Radioactivity was rapidly excreted with 93–95% excreted in 7 days, about one-third in the urine and two-thirds in the feces. The organs contained no detectable residual radioactivity, and low levels were found in fat and blood. The amounts were too low to allow characterization. About 46% of the total excreted was unchanged dihydrochlordene-dicarboxylic acid, and 10% was not extractable with methanol from the feces or with ether from the urine. The extracted components from feces and urine were qualitatively the same. Two isomers of monodechloro (methano-bridge chlorine) dihydrochlordene-dicarboxylic acid accounted for 22.5% of total excretion. The dimethyl ester of the parent compound accounted for 11.3% of the total. Two very polar conjugates which on hydrolysis with methanol/HCl and methylation formed the dimethyl ester of the parent compound constituted 4.5% of the excreted activity. The remaining 5.6% of the radioactivity was distributed among four components which were characterized by GLC-MS but not identified.

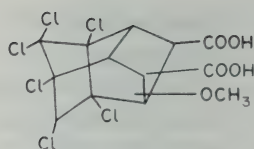
SUZUKI *et al.* (7) surveyed the photodieldrin contents of ninety-nine soils from an area in which aldrin had been extensively used. They found dieldrin in fifty-two samples ranging from 0.002 to 1.726 ppm. In only fourteen of the soils was photodieldrin detected and in all of these the dieldrin content was very high (0.4 – 1.3 ppm). The ratio of photodieldrin to dieldrin averaged 0.025 with a range of 0.006 to 0.069. Thus, it would appear that photodieldrin is a very minor terminal residue from aldrin in soils.

WEISGERBER *et al.* (8) isolated and identified the three metabolites of photodieldrin ^{14}C in soil shown in Chart 2.

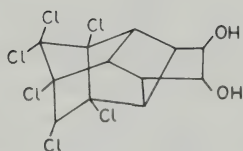
Five ppm of photodieldrin ^{14}C were mixed into the top 10 cm of soil under conditions which closely simulated actual field conditions. After 15 months the treated soil and the untreated lower layers were extracted



Metabolite 1
Bridged isomer of
dihydrochlordene
dicarboxylic acid



Metabolite 2
Bridged isomer of
dihydrochlordene
dicarboxylic acid,
methoxylated



or

Metabolite 3
Bridged isomer of
aldrin-*trans*-diol

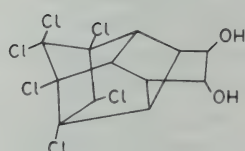


Chart 2. Soil Metabolites of Photodieldrin

with methanol and with 4% ammonium hydroxide. Total recovery was 84.5% of applied. Approximately 30% had leached into the 10-35 cm zone, and about 2% to greater depths. About 12% was in the form of metabolites and 20% unextractable.

WEISGERBER *et al.* (8, 9) also applied ^{14}C labeled isodrin to white cabbage leaves. After ten weeks six metabolites were found. Four were identified and proposed structures were given for two. The latter structures were postulated on the basis of mass spectra. The structural formulas and estimated percentages of recovered radioactivity are shown in Chart 3.

HUTSON and HOADLEY (10) found that *syn*-12-hydroxyendrin is converted into 12-keto-endrin by rat and rabbit liver 10,000 g supernatant. The reaction was enzymatic with a requirement for cofactors. A large difference in enzyme activity was found between male and female rats with preparations from female rats 14-fold less active. The reaction does not occur with *anti*-12-hydroxyendrin which is a principal mammalian metabolite.

Leaf application of ^{14}C -heptachlor to white cabbage plants [WEISGERBER *et al.* (11)] resulted in a residue which contained heptachlor, heptachlor epoxide, 1-hydroxy-chlordene, and other more hydrophilic metabolites. One

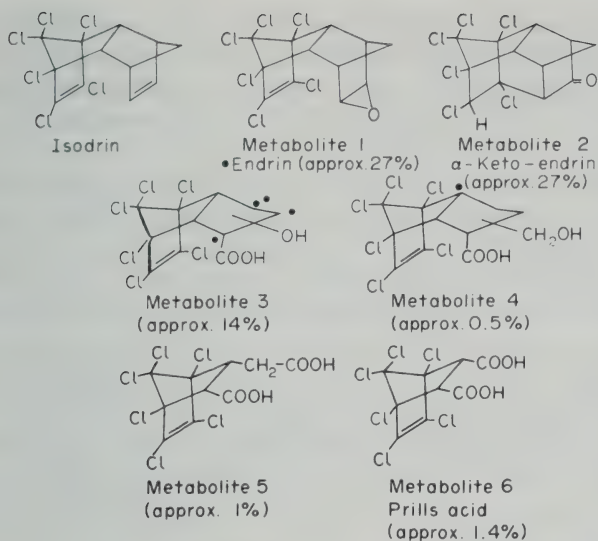


Chart 3. Metabolites of Isodrin Applied to White Cabbage

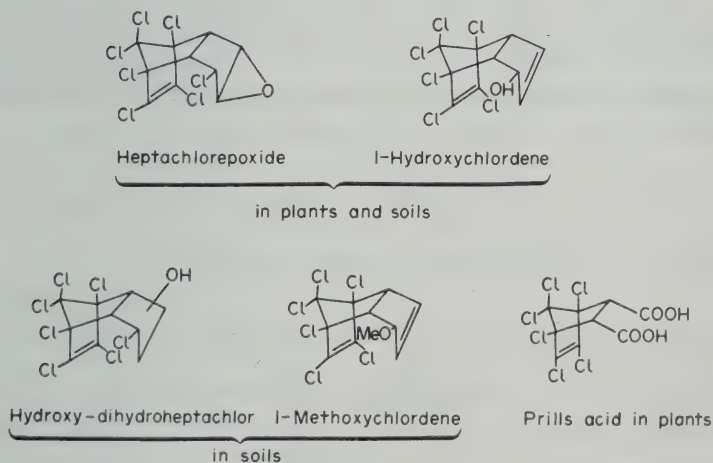


Chart 4

of the latter was demonstrated to be Prills acid (see Chart 4).

In soils after seed treatment of wheat, unchanged heptachlor, heptachlor epoxide, 1-hydroxychlorde, 1-methoxychlorde, and a hydroxy derivative of dihydroheptachlor (containing 7 chlorines) were found. The identification of all but the last were unequivocal, but the hydroxyl could not be placed in the last compound. Control experiments showed that the methoxy derivative was formed in soil and not in the separation and clean-up procedures.

Irradiation of aldrin, dieldrin and photodieldrin with u.v. light in an oxygen atmosphere produced HCl and CO₂ as well as the already known photoproducts and considerable unidentified polymeric materials [GÄB *et al.* (12)]. The reaction was much faster with a mercury lamp filtered only by quartz, but production of HCl and CO₂ occurred when the light was filtered through pyrex. In the upper atmosphere at least it would appear that aldrin, dieldrin and photodieldrin can be completely broken down by light.

GÄB *et al.* (13) showed that irradiation of solid photodieldrin in a closed vessel with u.v. light (> 230 nm) produced the two ketones shown in Chart 5 and photoaldrin-chlorohydrin. Nine other compounds were also produced in small yields, five with fewer chlorine atoms and two with more chlorines than photodieldrin.

When photodieldrin was adsorbed on kiesel gel, similar breakdown occurred. The u.v. spectrum of photodieldrin sorbed on kiesel gel is strongly bathochromically shifted and broadened so that light can be absorbed above 300 nm. This opens the possibility that the observed reactions above could take place in the lower atmosphere when photodieldrin is adsorbed on clay particles.

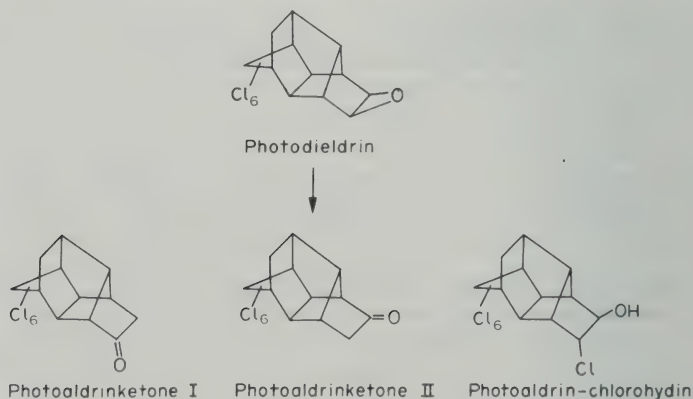


Chart 5

GÄB *et al.* (14) investigated the u.v. conversions of aldrin and chlordene adsorbed on a silica gel surface and compared these conversions with those for solid phase reactions where the materials were deposited on a glass surface. Aldrin on silica gel irradiated with a mercury lamp with pyrex filter produced mostly dieldrin, with photoaldrin, photodieldrin, and photo-keto-aldrin in important amounts. In comparison with the irradiation of solid aldrin on glass, it was clear that reaction with oxygen was much more extensive on silica gel. Similarly, chlordene irradiated on silica gel yielded mostly chlordene exo-epoxide along with some photochlordene, 1-exo-hydroxychlordene, keto-chlordene and an unidentified product. On glass plates photochlordene predominates.

ONUSKA *et al.* (15) photolyzed *cis*- and *trans*-chlordane using a mercury vapor lamp without filter. The expected half-cage analog of *cis*-chlordane was formed in high yield. *Trans*-chlordane formed one half-caged isomer apparently similar to the bridged structures reported for oxychlordane by IVIE [*J. Agr. Food Chem.* **21**, 1113–1115 (1973)].

References

1. W. MULLER, G. NOHYNEK, G. WOODS, F. KORTE, and F. COULSTON, *Chemosphere* No. 2, 89–92 (1975).
2. W. MULLER, G. WOODS, F. KORTE and F. COULSTON, *Chemosphere* No. 2, 93–98 (1975).
3. D. VOCKEL and F. KORTE, *Chemosphere* No. 5, 177–182 (1974).
4. L. KILZER, S. DETERA, I. WEISGERBER and W. KLEIN, *Chemosphere* No. 4, 143–148 (1974).
5. J. P. LAY, W. KLEIN and F. KORTE, *Chemosphere* No. 5, 193–198 (1974).
6. J. P. LAY, I. WEISGERBER and W. KLEIN, *Pesticide Biochem. Physiol.* **5**, 226–232 (1975).
7. M. SUZUKI, Y. YAMATO and T. WATANABE, *Bull. Environ. Contam. Toxicol.* **12**, 275–280 (1974).
8. I. WEISGERBER, D. BIENIEK, J. KOHLI and W. KLEIN, Unpublished manuscript, Inst. für Ökologische Chemie der Gesellschaft für Strahlen und Umweltforschung mbH, München.
9. I. WEISGERBER, W. TOMBERG, W. KLEIN and F. KORTE, *Chemosphere* No. 2, 99–104 (1975).
10. D. H. HUTSON and E. C. HOADLEY, *Chemosphere* No. 5, 205–210 (1974).

11. I. WEISGERBER, S. DETERA and W. KLEIN, *Chemosphere* No. 5, 221–226 (1974).
12. S. GÄB, H. PARLAR, S. NITZ, K. HUSTERT and F. KORTE, *Chemosphere* No. 5, 183–186 (1974).
13. S. GÄB, H. PARLAR and F. KORTE, *Chemosphere* No. 5, 187–192 (1974).
14. S. GÄB, V. SARAVANJA and F. KORTE, *Bull. Environmental Contam. Toxicol.* 13, 301–306 (1975).
15. F. I. ONUSKA and M. E. COMBA, *J. Assoc. Offic. Anal. Chem.* 58, 6–9 (1975).

Appendix II: Terminal Residues of Organophosphorus Compounds

I. COMPOUNDS TO BE EVALUATED AT THE 1975 JMPR

Chlorpyrifos-methyl

Mammalian and Plant Metabolism, Transformation in the Environment. Data are not yet available to the reviewer.

Milk and Meat Study. The persistence of chlorpyrifos-methyl in corn silage and the effects of feeding the treated silage to dairy cows were studied.

Corn was sprayed in the field at the dent stage of maturity with chlorpyrifos-methyl at 0.56, 1.12 and 2.24 kg/ha and ensiled 1 day later. The combined losses of chlorpyrifos-methyl and its pyridinol hydrolysis product during 83 days of ensiling were equivalent to 55, 71 and 76% respectively, of that applied.

After 83 days ensiling, control and treated silages were fed to sixteen cows (4 per treatment) for 42 days. The chlorpyrifos-methyl residues were stable and averaged 0.35, 0.87 and 1.85 ppm. The pyridinol residues averaged 0.44, 0.79 and 1.75 ppm, but declined during the study so that levels in the last week's feed averaged only 32% of that present in the silage fed the first week.

Average daily intakes were 0.009, 0.052 and 0.054 mg chlorpyrifos-methyl and 0.012, 0.020 and 0.051 mg pyrimidol/kg body weight. They had no effect on silage intake, milk production, blood cholinesterase activity or body weight gain.

Traces of chlorpyrifos-methyl (0.003 ppm or less) were found in the milk from cows on the 2.24 kg/ha treatment. Milk from all the cows fed

treated silage contained pyridinol at a level of 0.011 ppm or less. No oxygen analog of chlorpyrifos-methyl was found in any of the samples. Milk, urine and feces were free of residues within 1 week after withdrawal of the treated silage (1).

Cyanofenphos (Surecide^R)

Mammalian and Plant Metabolism. They were evaluated at the previous meeting (TR Commission, October 1974). Since then no new work has been reported.

Milk and Meat Study. Four groups of four dairy cows were fed a diet containing 0, 5, 15 and 50 ppm cyanofenphos for 30 days and then placed on a normal diet for 30 days. The average level of cyanofenphos residues in feedstuffs is considered to be 5 ppm.

Milk samples were taken 9 times during the first 30 days including day 0, and on days 37, 44, 51 and 60. Three cows from each group were sacrificed on day 30 and the remainder on day 60; liver, kidney, muscle and fat samples were collected.

Cyanofenphos and cyanofenphos-oxon residues in milk and tissues were extracted with methanol-acetonitrile, and partitioned between n-hexane and acetonitrile. Residues in the acetonitrile fraction were chromatographed on a Florisil column, which had been deactivated with 10% aqueous pH 7 buffer, and eluted with a mixture of 50% methylene chloride and 15% acetonitrile in n-hexane. Cyanofenphos and cyanofenphos-oxon residues were determined by g.l.c. on a 3% OV-1 column using a flame photometric detector.

Residues were found only in the milk of cows on the 50 ppm treatment. The highest levels of cyanofenphos (0.25 ppm) occurred at day 2 and 4; the oxon level (0.06 ppm) also peaked at day 4. The concentrations of both compounds in milk decreased thereafter, although the animals were still on the cyanofenphos-containing diet. After 30 days, the residue levels of cyanofenphos and its oxon were less than the detection limits, 0.002 ppm and 0.004 ppm respectively.

Residue levels in tissues sampled after 30 days feeding were highest in the fat and decreased in the order fat>>>liver>kidney≅muscle. The 50 ppm treatment resulted in levels of 0.9 ppm cyanofenphos and 0.09 ppm of the oxon in fat, whereas other tissues generally contained one-tenth the amount of these compounds. The other treatments gave hardly any measurable amounts of cyanofenphos or its oxon. At day 60, trace amounts (0.005 ppm) of cyanofenphos were sporadically detected in fat tissues (2).

Photodecomposition. An aqueous solution of cyano-¹⁴C-cyanofenphos (7 ppm) was exposed to bright sunlight for 20 days and aliquots of the solution were taken periodically and analyzed for photoproducts.

Cyanofenphos is relatively stable in aqueous solution; after 20 days' exposure, 78.3% of the recovered radioactivity was intact cyanofenphos. By extrapolation, the half-life is approximately 50 days. The predominant photoproducts were cyanofenphos-oxon and *p*-cyanophenol, amounting to 7.8% and 4.8%, respectively. These two photoproducts tended to increase with further irradiation.

A non-radioactive photoproduct was detected and identified as *O*-ethyl phenylphosphonic acid.

The following compounds were not present among the unidentified radioactive products; cyanofenphos-*S*-isomer, desethylcyanofenphos, desethylcyanofenphos-oxon, radioactive carbon dioxide and hydrogen cyanide.

By comparison, cyanofenphos films on silica gel chromatoplates underwent rapid photodecomposition ($t_{1/2} = 2$ days) yielding mainly cyanofenphos-oxon, *p*-cyanophenol and trace amounts of 2-hydroxy-5-cyanobenzoic acid. This acid, together with *p*-cyanobenzoic acid, was also produced in minor amounts by the u.v. irradiation of acetone solutions of cyanofenphos or *p*-cyanophenol, presumably by photoaddition and photosubstitution.

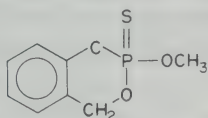
Several pesticides and antioxidants such as rotenone, phenazine, phenazine-*N*-oxide, BHA, BHT and 2,5-tert-butyl hydroquinone accelerated the photolysis of cyanofenphos, with an accompanying increase of the oxon and *p*-cyanophenol, whereas β -carotene, xanthophyll and chlorophyll were inactive.

Thus, in aqueous solution cyanofenphos is stable to sunlight, but as a surface deposit it is rapidly photodecomposed to products such as the oxon and *p*-cyanophenol, which are also mammalian and plant metabolites (3).

II. OTHER ORGANOPHOSPHORUS COMPOUNDS (PROGRESS IN THE PAST YEAR)

Mammalian Metabolism including Milk and Meat Study. Salithion^R, 2-methoxy-4H, 1, 3, 2-benzodioxaphosphorin-2-sulfide, labelled with carbon-14 at benzyl position, was administered orally to male rats at 9 mg/kg. It was rapidly absorbed and distributed into various tissues. The radioactivity was rapidly and completely eliminated, 82% was lost during the initial 24 h, mainly into the urine. Less than 1% of the applied Salithion was found in the

excreta. The urinary and fecal-labelled products consisted of at least 15 compounds, among which seven, representing approximately 80% of the radioactivity, were characterized. The predominant metabolite was desmethyl Salithion (45% of the radioactivity), followed in decreasing order of the

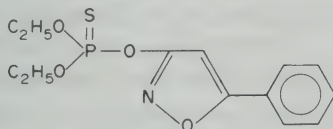


amount by *O*-methyl *O*-(2-hydroxy)benzyl hydrogen phosphorothioate, *O*-(2-hydroxy)benzyl dihydrogen-phosphorothioate, phosphate, saligenin and salioxon. The remaining unidentified products did not appear to be conjugates.

No distinct changes in excretion patterns were observed on the administration of larger amounts (45 mg/kg, or five consecutive doses of 9 mg/kg every other day) (4).

The metabolism of isoxathion, Karphos^R, *O*-*O*-diethyl *O*-(5-phenyl-3-isoxazolyl) phosphorothioate-5-carbon-14 was studied by oral administration at a dosage of 20 mg/kg to male rats.

The radioactivity was rapidly distributed in animal tissues and excreted. Within 24 h, approximately 83% and 12% of the initially given radioactivity were recovered in the urine and feces, respectively, and the recovery was substantially complete after 4 days. A trace of unchanged isoxathion was present in the feces, but no oxygen analog was excreted.



Thin-layer chromatograms of the urinary labelled products agreed well with those of the urinary metabolites from 5-phenyl-3-hydroxyisoxazole, implying complete cleavage of P—O—C bond (isoxazole). Among eleven urinary metabolites, the sulfate and glucuronide conjugates of 5-phenyl-3-hydroxyisoxazole accounted for *ca.* 60% of the radioactivity. Free 5-phenyl-3-hydroxyisoxazole and hippuric acid were minor products. Benzoic acid, which is a precursor of hippuric acid, was formed *in vitro* from 3-hydroxy-5-phenylisoxazole via benzoylacetamide, although the presence of the acetamide was not demonstrated *in vivo* (5).

Two reports are presented dealing with mammalian metabolism of diazinon.

Two groups of two female beagles were given either 0.2 mg/kg of ethoxy-carbon-14-diazinon intravenously or 4 mg/kg of ring-labelled diazinon orally and the 24-h pooled urine samples analyzed for the radioactive metabolites.

Fifty-eight per cent of the ethoxy-carbon-14 was recovered, with *O*, *O*-diethyl phosphoric acid representing 16% and *O*, *O*-diethyl phosphorothioic acid 42%. On the other hand, 85% of ring-carbon-14 was excreted. Two metabolites were identified; one was 2-isopropyl-4-methyl-6-pyrimidinol (10%) and the other, its oxidation product involving the tertiary carbon atom of the isopropyl side chain (23%). The remaining labelled products (53%), which were more polar, were not characterized. All the metabolites identified are already known from work with other mammalian species (TR Commission, 1974) (6).

In another study, sheep were orally dosed with 450 or 600 mg/kg of diazinon, and the residues of hydroxydiazinon, dehydrodiazinon as well as diazinon determined by g.l.c. in brain, liver, kidney cortex and medulla, muscle and fat. Even after 2 weeks, when other tissues contained 2 ppm or less of diazinon, fat still contained 47~65 ppm. The hydroxydiazinon and dehydrodiazinon contents in fat far exceeded those in other tissues. However, diazoxon was never found in any determination (7).

These findings might be useful for diagnostic purposes for suspected intoxication, but from the viewpoint of terminal residues, it seems, they are of little significance because of the very high dosages used.

A Holstein cow was fed 5 ppm methidathion in the diet for 4 days. Milk was sampled 1 day prior to feeding, daily throughout the feeding period and for 6 days thereafter. Methidathion was extracted from milk by acetone, cleaned-up on a Florisil column and determined by g.l.c. with an electron affinity detector using a 2% OV-17 and 2% QF-1 mixed column.

No methidathion was found above the detection limit of 0.008 ppm (8).

Plant Metabolism. The dissipation of parathion was determined from field sprayed spinach. Parathion applied at 0.5 lb/acre steadily decreased, from 25.2 ppm, 1 day after spraying, to 0.2 ppm 14 days post-treatment. The levels of aminoparathion, *S*-ethylparathion, paraoxon and *p*-nitrophenol were highest 1 day after treatment, aminoparathion residue being 0.4 ppm and others, *ca.* 0.18 ppm each. Treatment at 1 lb/acre showed a similar decline of parathion from 56.3 ppm at day 1 to 0.36 ppm at day 14. *S*-phenylparathion was also detected after 1 day (0.04 ppm) in addition to the compounds reported above. However, because the technical product contained these compounds as impurities, their actual rate of formation in

the field could not be assessed. The concentrations of the related compounds also decreased rapidly, the residues from the 0.5 lb/acre treatment totalled 0.06 ppm after 14 days (9).

The formation of aminoparathion was demonstrated in plants *in vitro* (10, 11). Fortified with NADP plus glucose-6-phosphate, spinach homogenate was active in reducing the nitro group of parathion under anaerobic but not under aerobic conditions. Further addition of FAD was more active. The optimum pH for the reduction was around 8.0 ~ 8.3.

Nitrosoparathion added to the reaction mixture was readily reduced to aminoparathion via hydroxylaminoparathion. Although nitrosoparathion and hydroxylaminoparathion were not found in the reaction mixture, they may act as consecutive intermediates.

Foliar application of radioactive Salithion to bean plants resulted in the rapid loss of the radioactivity due to evaporation, with a minor portion being translocated to other leaves, stem and roots.

Salithion in nutrient solution was absorbed into bean plants and rice seedlings. In both plants, the concentrations of salioxon and free saligenin were each 1% of the absorbed radioactivity, after 10 days. The major metabolites in bean plants were identified as salicin, *O*-hydroxybenzyl- β -D-glucose, desmethylsalithion and *O*-(2-hydroxy)benzyl dihydrogen phosphorothioate. In rice plants, the two glucosides were found together with other unidentified water-soluble metabolites (4).

Dimethoate-treated grapes were analyzed for *N*-hydroxy-methyl-dimethoate, de-*N*-methyl-dimethoxon, de-*N*-methyl-dimethoate, dimethoxon and the *O*-glucoside of *N*-hydroxymethyl dimethoate (after acid hydrolysis) by g.l.c. on 1% EGSS-X. Although dimethoate was degraded from a maximum level of 18 ppm to 0.5 ppm during 35 days, dimethoxon present at a maximum level of 0.26 ppm, did not accumulate. The levels of *N*-hydroxymethyl and de-*N*-methyl analogs were below 0.05 ppm. No evidence for the presence of the sugar adducts was found at the validated sensitivity level of 0.05 ppm (12).

To investigate the behavior of methylene-¹⁴C-phorate in different soil types and also penetration, translocation and metabolism in plants, corn was grown in the radioactive phorate-treated soil layer on top of an insecticide-free soil and water was applied periodically.

Under both percolating and non-percolating conditions, 12% of the applied radioactivity moved into the lower layer of agricultural soils as phorate sulfoxide and phorate sulfone. Phorate was still present in the upper

layers of all the soils, but moved only in a quartz sand.

Water percolated through a quartz sand, sand and a sand-silt loam mixture contained 16.4, 2.8 and 1.8% of the applied radioactivity, respectively, which was identified as phorate (quartz sand only), phorate sulfoxide and phorate sulfone.

Although all soils still contained phorate, only its metabolites were found in the plants. The roots contained primarily phorate sulfone and some phorate sulfoxide, while the greens also contained phoratoxon sulfoxide and phoratoxon sulfone.

Roots of plants grown in a quartz sand contained 2.5~5 times more phorate-derived materials than those grown in an agricultural soil. However, the amounts of radioactive materials translocated into the corn greens were similar with all soils (13).

Residues of quinalphos, Ekalux^R, and its oxygen analog were determined in ten vegetable crops by g.l.c. using a mixed 3% OV-25 and OV-210 column. The compounds were extracted with ethyl acetate and subjected to sweep codistillation before quantitation. The initial deposits of quinalphos varied from 0.28 ppm on tomatoes to 5.67 ppm on wheat plants. In 10 days, the residue levels dropped below 0.1 ppm except for cherries.

The oxygen analog was detected only in cherries and wheat plants. In cherries, the maximum amount was 0.56 ppm after 7 days but in wheat plants the metabolite was still present in the day-50 sample, with a maximum of 0.09 ppm on day 28 (14).

Thirteen crops were analyzed for leptophos, leptophos-oxon and 4-bromo-2, 5-dichlorophenol. Although the residues were not present in significant amounts at harvest, if applied in the early stages of plant growth, then leptophos persisted for a considerable time after application. In cabbage, broccoli and cauliflower, the residue levels found 13 days after application were less than 1 ppm.

Leptophos-oxon and the phenol were minor metabolites in every crop being approximately one-tenth to one-hundredth the amount of leptophos (15).

Photodecomposition. Several reports have appeared dealing with the photodecomposition of organophosphorus compounds.

Parathion, neat and as 50% methanol or acetone solutions was exposed to high intensity u.v. light for 35 days. The organic solvents caused no appreciable difference in photolytic patterns.

When parathion had decreased to approximately 10%, the predominant photoproduct was paraoxon, followed by *p*-nitrophenol, *S*-ethylparathion

and *S*-phenylparathion. Seven other minor products were also identified (16).

A film of pyrimitate was irradiated with a 15-W mercury lamp for 4 h, six photoproducts were identified, including four phosphorothioates with sequentially oxidized dimethylamino groups, $-N(CH_3)CHO$, $-NHCH_3$, $-NHCHO$ and NH_2 . The other two compounds were the oxygen analog of pyrimitate and a dimerization product of pyrimitate with molecular weight of 594 ($C_{21}H_{36}O_6N_6P_2S_2$), which may be formed by elimination of a carbon atom from two dimethylamino groups (17).

Thin films of methidathion were irradiated by several different u.v. lamps, a xenon lamp and with sunlight. The half-life under u.v. light varied from 20 to 200 h, depending on the type of lamp. Irradiation with the xenon lamp for 92 h or with sunlight for 60 h resulted in only 10% breakdown. Among the photoproducts, twelve compounds were characterized but not quantitated. They include five compounds containing only the phosphorus moiety, 2-methoxy- Δ^2 -1,3,4-thiadiazolin-5-one, its 4-methylthiomethyl and 4-methyldithiomethyl analogs, bis(2-methoxy- Δ^2 -1,3,4-thiadiazolin-5-on-4-yl) disulfide and 1,3,4-oxodiazolidine-2,5-one. Sunlight irradiation produced fewer photoproducts (18).

Photolysis of Imidan^R in diethyl ether under laboratory conditions led to the formation of two photoproducts, *N*-methylphthalimide and *N*-methoxymethylphthalimide. No compounds containing phosphorus or sulfur were isolated (19).

Photodecomposition of fenitrothion, Sumithion^R (20) was discussed in the previous TR Commission meeting (1974).

Some of the above photodecomposition studies were carried out under somewhat extreme experimental conditions which cannot be directly related to the actual field conditions. Hence, the results must be cautiously evaluated.

References

1. J. C. JOHNSON, Jr., R. L. JONES, D. B. LEUCK and M. C. BOWMAN, *J. Dairy Sci.* **57**, 1467 (1974).
2. J. MIYAMOTO, Y. TAKIMOTO, M. L. KEPLINGER, R. J. WINGENDER and D. H. JENKINS, unpublished observation (1975).
3. N. MIKAMI, H. OHKAWA and J. MIYAMOTO, unpublished observation (1975).
4. K. MIHARA and J. MIYAMOTO, *Agric. Biol. Chem.* **38**, 1913 (1975).
5. M. ANDO, M. NAKAGAWA and K. TOMITA, *Agric. Biol. Chem.* **39**, 803 (1975).

6. F. IVERSON, D. L. GRANT and J. LACROIX, *Bull. Environ. Contam. Toxicol.* **13**, 611 (1975).
7. A. F. MACHIN, P. H. ANDERSON and C. N. HEBERT, *Pestic. Sci.* **5**, 49 (1974).
8. L. E. ST. JOHN and D. J. LISK, *Bull. Environ. Contam. Toxicol.* **12**, 594 (1974).
9. T. E. ARCHER, *J. Agric. Food Chem.* **22**, 974 (1974).
10. T. SUZUKI and M. UCHIYAMA, *J. Hyg. Chem. (Japan)* **20**, 93 (1974).
11. T. SUZUKI and M. UCHIYAMA, *J. Agric. Food Chem.* **23**, 281 (1975).
12. W. A. STELLER and W. B. BRAND, *J. Agric. Food Chem.* **22**, 445 (1974).
13. E. P. LICHTENSTEIN, T. W. FUHREMAN and K. R. SCHULZ, *J. Agric. Food Chem.* **22**, 991 (1974).
14. R. MAES, R. H. DROST and H. SAUER, *Bull. Environ. Contam. Toxicol.* **11**, 121 (1974).
15. H. E. BRAUN, F. L. McEWEN, R. FRANK and G. RITCEY, *J. Agric. Food Chem.* **23**, 90 (1975).
16. R. L. JOINER and K. P. BACTCKE, *J. Assoc. Offic. Anal. Chem.* **57**, 408 (1974).
17. A. F. MACHIN, D. E. MUNDY, M. P. QUICK and N. F. JANES, *Pestic. Sci.* **5**, 741 (1974).
18. W. P. DEJONCKHEERE and R. H. KIPS, *J. Agric. Food Chem.* **22**, 959 (1974).
19. M. TANABE, R. L. DEHN and R. R. BRAMHALL, *J. Agric. Food Chem.* **22**, 54 (1974).
20. H. OHKAWA, N. MIKAMI and J. MIYAMOTO, *Agr. Biol. Chem.* **38**, 2247 (1974).

Appendix III: Dichloroacetaldehyde

The organophosphorus insecticide dichlorvos has been reviewed (1—4) by the Joint Meeting of FAO/WHO in 1965, 1966, 1967 and 1970. The Joint Meeting has commented that 'dichlorvos is rapidly metabolized in mammalian tissues to relatively non-toxic metabolites which are rapidly excreted' (2) and also that 'recent information has disclosed that dichlorvos is rapidly converted in plants, to dichloroacetaldehyde and further to dichloroethanol. As these metabolites are also known to occur in mammals after dichlorvos administration, it was concluded that the assessment of the safe levels of dichlorvos included that of the metabolites' (3).

In the reports of the Joint Meeting until 1970 (5) the phrase 'Content of

dichloroacetaldehyde (DCA) to be reported where possible' was included in the annex summarizing the recommendations, but since that time the reports have not contained this request.

Since the last Joint Meeting review, further studies have been published (6-9) which have confirmed that DCA occurs in the metabolic pathway in many organs in mammals and that it is itself rapidly eliminated.

Methods of analysis based on g.l.c. with electron-capture detection are available for the determination of DCA in foods (10) and tissues (11).

A number of residue studies including DCA have been considered by the Joint Meeting (3, 4, 10). A laboratory study on lettuce showed that DCA occurred from the time of treatment with dichlorvos until 7 days later at up to 10% of the dichlorvos value (3). Realistic experiments in which direct dermal applications were made to dairy cattle or where dichlorvos/PVC generators were hung in cheese, butter or ice-cream factories showed that residues of DCA (and dichlorvos) were not detected in the milk or in the finished factory products (4). In one experiment in the UK where dichlorvos generators were hung in shops (4, 10) and unwrapped foodstuffs sampled, dichlorvos residues were found in some samples but all DCA values were less than the limit of determination.

These studies show that DCA is unlikely to occur as a significant residue following the use of dichlorvos. The conclusion may be drawn that there seems to be no reason to reinstate the request to report the content of DCA where possible.

References

1. *Evaluation of the Toxicity of Pesticide Residues in Food*, FAO/WHO, 1965.
2. *Evaluation of some Pesticide Residues in Food*, FAO/WHO, 1966.
3. *1967 Evaluations of some Pesticide Residues in Food*, FAO/WHO, Rome, 1968.
4. *1970 Evaluations of some Pesticide Residues in Food*, FAO/WHO, Rome, 1971.
5. *Pesticide Residues in Food*, WHO Technical Report Series No. 474, Geneva, 1971.
6. J. W. GILLET, J. R. HARR, F. T. LINDSTROM, D. A. MOUNT, A. D. St. CLAIR and L. J. WEBER, *Residue Reviews* **44**, 115 (1972).
7. A. C. PAGE, J. E. LOEFFLER, H. R. HENDRICKSON, C. K. HUSTON and D. M. de VRIES, *Ark. Toxikol.* **30**, 19 (1972).

8. D. H. HUTSON and E. C. HOADLEY, *Ark. Toxikol.* **30**, 9 (1972).
9. A. P. ZAIKA, *Fiziol. Aktiv. Veshchestva* **24** (1974); *Chem. Abstr.* **79**, 28098 (1973).
10. K. E. ELGAR, B. L. MATHEWS and P. BOSIO, *Environ. Qual. Safety* **1**, 217 (1972).
11. D. R. SCHULTZ, R. L. MARXMILLER and B. A. KOOS, *J. Agric. Food Chem.* **19**, 1238 (1971).

Appendix IV: (a) Carbaryl

The lack of adequate methodology has been the major problem in the determination of carbamate insecticide residues. However, recent advances in this area look hopeful. In particular, sulfonate derivatives of carbamate pesticides (1) yield sensitivities to carbaryl, carbofuran, propoxur, aminocarb, mexacarb, aldicarb and Mobam in the subnanogram range using electron capture g.l.c. detectors. Direct determination of some *N*-methylcarbamates (2) using a highly deactivated carbowax g.l.c. column (3) allowed quantitation of promecarb, mexacarb, carbaryl and methiöcarb in the nanogram range.

Cigarette smoke, a heretofore neglected source of pesticide exposure, was investigated (4); 10–25% of the ^{14}C -carbaryl in spiked cigarettes was transferred to mainstream smoke; 40% of this was unaltered carbaryl and 30–50% of the total inhaled ^{14}C -equivalents was exhaled. Thus about 5% of the parent compound was transferred to the smoker.

Various human tissue explants using *in vitro* organ maintenance techniques (5) demonstrated the relative metabolic activity of carbaryl to be: liver > lung > kidney > placenta > vaginal mucosa > uterus. Hepatic tissues performed as expected, demethylation and/or hydrolysis, hydroxylation and oxidation followed by conjugation. The kidney produced naphthylglucuronide whereas the uterus, lung and placenta produced naphthyl sulfate from carbaryl. Seventy per cent of the ^{14}C -carbaryl exposed to human embryonic lung cell culture for 72 h was converted to oxidized metabolites (6). The remaining 30% was as water-soluble materials. Unconjugated metabolites were 1-naphthol, 4- and 5-hydroxycarbaryl and 5,6-dihydro-5,6-dihydroxycarbaryl. Material released from the water solubles after hydrolysis were 4-hydroxy-, and 5,6-dihydroxy-5,6-dihydrocarbaryl and 1,4-naphthalenediol.

Single oral dose feeding studies with sheep, rabbits and hogs demonstrated tissue-retention characteristics similar to previous studies utilizing ^{14}C -labeled material in other animals (7).

Sheep bathed on 0.1 and 0.85% emulsions of carbaryl contained residues of 1-2 and 2-5 $\mu\text{g}/\text{cm}^2$ 1 day after bathing. Naphthol was also detected.

Serum alkaline phosphatase levels were increased in sheep in the 0.85% dosage group. Blood inorganic phosphorus levels also increased (8).

Three days after spraying carbaryl at a rate of 1 lb/A, no residues (sensitivity = 0.01 ppm) were found in the ground-feeding towhee (9).

One month after spraying an area of subarctic tundra with carbaryl for mosquitoes, samples of flora contained 0.1 to 2.4 ppm. Muscle samples from various birds contained 1.5 ppm carbaryl. Liver samples from male, female and young birds contained 1.1, 1.8 and 12 ppm carbaryl. Levels in the testes, uteri and embryos were 10, 3 and 5 ppm.

One year after exposure to carbaryl (2.5 kg/ha), testicle and epididymis weight and female fertility were the same in control and exposed mongolian tree creepers (10). Cytomorphological analysis showed atypical spermatozooids, blood elements and necrotic cells in the spermatogenous epithelium. Increased leucocyte levels in the germinative epithelium accompanied reduced reproduction capacity. Carbaryl was detected in 91% of the liver and genitalia samples. Carbaryl levels of 1.5 and 0.7 ppm were found in testicles which had pronounced and moderate cytomorphological aberrations.

Houseflies, blowflies and grass grubs metabolized carbaryl to water-soluble metabolites which were chromatographically and ionophoretically similar to those of the conjugates of 1-naphthol, with glucose, sulfate, phosphate and glucose-6-phosphate (11). Residues of carbaryl in honeybees (12) fed 2 ppm carbaryl ranged from 0.025 to 0.050 ppm. A maximum of 0.05 to 0.1 ppm was found in the bee bread of carbaryl fed bees. After 4 h exposure to carbaryl, alfalfa leaf-cutting bees contained unchanged carbaryl as the major extractable material (13). Naphthol, 5,6-dihydro-5, 6 hydroxy- and 5-hydroxycarbaryl were recovered from acid hydrolysis of water-soluble conjugates.

The disappearance of carbaryl from soil did not show first-order kinetics, 95% disappeared during the first 135 days. The remaining 5% decayed more slowly, 25 to 116 days. Only about 0.1% of the 4 kg applied to the field was lost in runoff water (14). Soil samples from an apple orchard which was treated with carbaryl contained no residues of the insecticide 14 days post-treatment (15).

References

1. A. H. MOYE, Esters of sulfonic acids as derivatives for the gas chromatographic analysis of carbamate pesticides. *J. Agric. Food Chem.* 23, 415 (1974).
2. E. J. LORAH and D. HEMPHILL, Direct chromatography of some *N*-methylcarbamate pesticides. *J. Assoc. Offic. Anal. Chem.* 57, 570 (1974).

3. W. H. AUE, H. CORAZON, and K. SHUBHENDER, On the unexpected behavior of a common gas chromatographic phase. *J. Chromatogr.* **77**, 299 (1973).
4. Y. ATALLAH and H. DOROUGH, Insecticide residues in cigarette smoke, Transfer and fate in rats. *J. Agric. Food Chem.* **23**, 64 (1975).
5. B. H. CHIN, J. ELDRIDGE and L. SULLIVAN, Metabolism of carbaryl by selected human tissues using an organ-maintenance technique. *Clin. Toxicol.* **7**, 37 (1974).
6. T. H. LIN, H. NORTH and R. MENZER, Metabolism of carbaryl (1-naphthyl *N*-methylcarbamate) in cell cultures. *J. Agric. Food Chem.* **22**, 253 (1975).
7. S. D. ANTISIFEROV, V. MAKAROV, and N. ZHAVORONKOV, Appraisal of the meat of carbaryl-poisoned animals. *Veterinariya* **10**, 110 (1972).
8. I. N. GLADENKO, O. MALININ, V. SHULYAK, M. KARLASHEV and L. ZAYTSEVA, Effects of Sevin, dicrysyl, and chlorophos on sheep. *Veterinariya* **7**, 73 (1970).
9. D. A. KURTZ and C. STUDHOLME, Recovery of trichlorofon and carbaryl in songbirds following spraying of forest for gypsy moth. *Bull. Environ. Contam. Toxicol.* **11**, 78 (1974).
10. T. V. KRYLOVA and A. DENIXOVA, Effect of carbaryl on the Mongolian tree creeper. *Biol. Nauki* **10**, 25 (1973).
11. M. P. HEENAN and J. SMITH, Water-soluble metabolites of *p*-nitrophenol and 1-naphthyl *N*-methylcarbamate in flies and grass grubs: formation of glucose phosphate and phosphate conjugates. *Biochem.* **5**, 144, 303 (1974).
12. W. WINTERLIN, G. WALKER and A. LUCE, Carbaryl residues in bees, honey, and bee bread following exposure to carbaryl via the food supply. *Arch. Environ. Contam. Toxicol.* **4**, 362 (1973).
13. N. GUIRGUIS and W. BRINDLEY, Carbaryl penetration into and metabolism by alfalfa leaf cutting bees *Megachile pacifica*. *J. Agric. Food Chem.* **22**, 274 (1975).
14. J. H. CARO, H. FREEMAN and B. TURNER, Persistence in soils and losses in runoff of soil-incorporated carbaryl in the small watershed. *J. Agric. Food Chem.* **22**, 860 (1974).
15. R. J. KUHR, A. DAVIS and J. BOURKE, Dissipation of Guthion, Sevin, Polyram, Phygon and Systox from apple orchard soil. *Bull. Environ. Contam. Toxicol.* **1**, 224 (1974).

(b) Carbofuran

When cigarettes were spiked with ^{14}C -carbofuran and artificially smoked, 10–30% of the radioactivity in the spiked zone was transferred to mainstream smoke. When rats were administered this smoke endotracheally 40–50% of the ^{14}C -label was exhaled and after 2.5 min 30% and 17% of this amount was located in the lungs and blood respectively. A major component in the mainstream smoke was the phenolic derivative of carbofuran (1).

Mice fed a single dose of ^{14}C -(2-toluenesulfonyl)-carbofuran excreted most of the radiocarbon in the urine after 24 h(2). Urinary metabolites included 3-hydroxy-*N*-hydroxymethylcarbofuran, 3-hydroxycarbofuran and three phenolic compounds. This compound was metabolized rapidly in houseflies but carbofuran was recovered in small but potentially lethal amounts from housefly tissue.

A 2-year study in cornfields showed that the disappearance of carbofuran from soil followed first-order kinetics with a half-life of 46–117 days (3). In seed furrow applications, acidic soil and low soil temperature effected increased persistence. Only 0.5–2.0% of the carbofuran applied was lost in runoff with the loss being less in furrow application than broadcast application. Corn plants accumulated 0.14% of the applied pesticide by late summer but residues decreased sharply by harvest. Most of the pesticide in the leaves had been metabolized to 3-hydroxycarbofuran. In soils, 5–10% was converted to 3-ketocarbofuran. In alkaline soils chemical hydrolysis of carbofuran was the major mode of degradation. In acidic soils both chemical and microbial degradation was observed. Studies utilizing carbonyl- ^{14}C -carbofuran indicated that most of the label was recovered as $^{14}\text{CO}_2$. As much as 71% of the ^{14}C -label was initially bound in the soil. Carbofuran was probably hydrolyzed to the phenol, immediately bound to the soil, and slowly metabolized by microorganisms (4).

Studies using two species of soil worms, *Eisenia foetida* and *Lumbricus terrestris*, showed carbofuran to be twice as toxic to the *E. foetida* when applied to the soil and 6 times more toxic when injected (5). *E. foetida* was repelled by the insecticide while *L. terrestris* was not. Both worms took up carbofuran in quantities proportional to their size; however, *E. foetida* excreted 95% in 48 h compared to only 10% for the *L. terrestris*. Half of the material excreted from *E. foetida* was unchanged insecticide.

References

1. Y. H. ATALLAH and W. DOROUGH, Insecticide residues in cigarette smoke. Transfer and fate in rats. *J. Agric. Food Chem.* **23**, 64 (1975).
2. A. L. BLACK, Y. CHIU, T. FUKUTO, and T. MILLER, Metabolism of 2,2-dimethyl-2,3-dihydrobenzofuranyl-7 *N*-methyl-*N*-(2-toluenesulfonyl) carbamate in the housefly and white mouse. *Pestic. Biochem. Physiol.* **3**, 435 (1973).
3. J. H. CARO, H. FREEMAN, D. GLOTFELTY, B. TURNER and W. EDWARDS, Dissipation of soil-incorporated carbofuran in the field. *J. Agric. Food Chem.* **21**, 1010 (1973).
4. L. W. GETZIN, Persistence and degradation of carbofuran in soil. *Environ. Entomol.* **2**, 461 (1973).
5. A. P. GILMAN and A. VARDANIS. Carbofuran. Comparative toxicity and metabolism in the worms *Lumbricus terrestris* L. and *Eisenia Foetida* S.J. *J. Agric. Food Chem.* **22**, 625 (1974).

(c) Mexacarbate and Methiocarb

An intraperitoneal dose of ^{14}C -mexacarbate to rats exhibited rapid maternal distribution and placental transfer (1). In the period from 15 min to 8 h after dosing, the residues in pooled fetuses decreased from 1.7% to 0.8% of the dose. The levels observed at the same times after dosing with methiocarb were 3.5% and 1.1%. Fetal kidney and heart contained the most ^{14}C -label after both mexacarbate and methiocarb administration. More radioactive $^{14}\text{CO}_2$ derived from ^{14}C -mexacarbate and ^{14}C -methiocarb was exhaled by non-pregnant rats (mexacarbate 82.6%, methiocarb 76.7%) than by pregnant rats (mexacarbate 62.2%, methiocarb 66.9%). There was no significant difference in urinary excretion of ^{14}C -label by pregnant or nonpregnant rats with either test compound. Overall, pregnant animals retained 10.4–23% more ^{14}C -label than nonpregnant rats treated with either mexacarbate or methiocarb.

Fetal and maternal brain tissues of rats converted 12% of the mexacarbate to the *N*-dimethylated form (2). No metabolism was noted in the placenta or fetal liver. The greatest metabolism occurred in maternal liver (16%), *N*-demethylation and 14% *N*-methylhydroxylation. Sulfoxidation (12.3%) and hydroxylation (7.9%) of methiocarb was noted in maternal liver. Fetal liver produced 23.1% sulfoxide. Fetal and maternal brain showed no metabolic activity with methiocarb.

References

1. L. WHEELER and A. STROTHER, Placental transfer, excretion, and disposition of (^{14}C) Zectran and (^{14}C) Mesurol in maternal and fetal rat tissues. *Toxicol. Appl. Pharmacol.* **30**, 163 (1974).
2. L. WHEELER and A. STROTHER, *In vitro* metabolism of ^{14}C -pesticidal carbamates by fetal and maternal brain, liver, and placenta of the rat. *Drug. Metab. Disposition* **2**, 533 (1974).

(d) Other Carbamate Insecticides

Aldicarb when applied with phorate as a systemic soil insecticide to soybeans was not affected with respect to uptake and metabolism by the presence of a series of forty-five plant growth regulators applied to the foliage. Aldicarb residues from soybean leaves were primarily aldicarb, aldicarb sulfoxide and sulfone (1). Aldicarb and its metabolites were nontoxic to selected plants and microorganisms, but were toxic to insects and nematodes (2).

Spraying tomatoes with 0.03% methomyl yielded 50% control of white flies during a 7-day study (3). Ninety-eight per cent control during the same period was achieved by using 0.06% methomyl. Tomatoes contained 0.11 ppm, 0.18 ppm and 0.35 ppm methomyl residues 7 days after each of three successive sprayings at the 0.03% level. Tobacco leaf retained 0.1 ppm methomyl residues 65 days after spraying (4). Methomyl applied to cotton had the fastest rate of disappearance of eleven formulations of pesticides tested (5).

A series of *Pseudomonas* isolated from soil was shown to utilize the phenylcarbamate insecticide dioxacarb (2-[1,3-Dioxalan-2yl] phenyl-*N*-methyl-carbamate) as the sole carbon source in a minimal medium (6). Eighty-five per cent of the ^{14}C -dioxacarb was evolved as $^{14}\text{CO}_2$. No other degradation product was observed. Kinetic studies showed that chemical hydrolysis in a defined medium was a first-order reaction. The hydrolysis products were defined as salicylaldehyde, methylamine and ethyleneglycol. Oxidation of the chemical breakdown products was demonstrated, as well as the presence of key enzymes involved in the metabolism of these products (6).

Breakdown of Landrin in the soil was found to be dependent upon soil types but not upon the amount of organic matter. Breakdown rates increased with increasing soil pH (above pH 7), indicating alkaline hydrolysis as the major cause of Landrin degradation (7).

In cotton plants, the carbamate pesticide Diamond Shamrock DS-15647

(3,3-dimethyl-1-[methylthio]-2-butanone *O*-[methylcarbamoyl] oxime) was rapidly oxidized to its sulfoxide derivative, which was further oxidized, but more slowly, to the more toxic sulfone form (8). Degradation of the toxic forms occurred primarily by conversion to unidentified water soluble products. Similar changes occurred in the soil but at a slower rate.

References

1. H. R. KRUEGER and J. MASON, Effects of plant growth regulators on levels of phorate and aldicarb in soybeans. *J. Agric. Food Chem.* **22**, 338 (1974).
2. H. W. SPURR and A. SOUSA, Potential interactions of aldicarb and its metabolites on nontarget organisms in the environment. *J. Environ. Qual.* **3**, 130 (1974).
3. H. R. KRUEGER and J. MASON, Application of methomyl to greenhouse tomatoes: greenhouse white fly control and residues in foliage and fruits. *J. Econ. Entomol.* **66**, 1223 (1973).
4. L. SCHIPFER, Residues in tobacco after precise use of fungicides and insecticides in the field. *Fachliche Mitt. Oesterr. Tabakregie* **14**, 266 (1973).
5. G. W. WARE, Dislodgeable leaf residues of insecticides on cotton. *Bull. Environ. Contam. Toxicol.* **11**, 434 (1974).
6. L. D. LEVAC, Degradation of the phenylcarbamate insecticide Elocron by a soil pseudomonad. *Diss. Abstr. Int.* **35**, 3472B (1975).
7. R. I. ASAI, F. GUNTHER and F. WESTLAKE, Influence of some soil characteristics on the dissipation rate of Landrin insecticide. *Bull. Environ. Contam. Toxicol.* **11**, 352 (1974).
8. C. J. WHITTEN and D. BULL, Fate of 3, 3-dimethyl-1-(methylthio)-2-butanone *O*-methylcarbamoyl oxime (Diamond Shamrock DS-15647) in cotton plants and soil. *J. Agric. Food Chem.* **22**, 234 (1974).

Appendix V: Comment on the Possible Mutagenicity and Carcinogenicity of *N*-Nitroso Derivatives of Carbamates

In the previous meeting of Commission on Terminal Pesticide Residues (October 1974) we had discussed the occurrence and possible toxicological significance of nitrosocarbaryl reported by ELESURU and LIJINSKY (1) and by ELESURU *et al.* (2). The past year encountered several reports on the studies of the toxicological properties of nitrosocarbamates.

UCHIYAMA *et al.* (3) tested mutagenicity of nitroso derivatives

of carbaryl and 7 *N*-methylcarbamates including BPMC (*o*-secondarybutyl-phenyl-), MTMC (*m*-cresyl-) and MPMC (3,4-xylyl-) by means of back mutation of *E. coli* B/r WP-2 trp and also by rec assay method (recombination deficient *B. subtilis* Marburg 45T and recombination capable *B. subtilis* Marburg 17A).

Nitroso-CPMC (*o*-chlorophenyl) is as strong a mutagen as *N*-methyl-*N'*-nitro-*N*-nitrosoguanidine (positive at 0.5 μ g/plate), followed by nitroso-MTMC and -XMC (3,5-xylyl), while by rec assay method nitroso-BPMC (0.005 μ g/plate) and nitroso-MIPC (0.01 μ g/plate) are among the most potent ones, much more potent than mitomycin C.

Our unpublished observations confirm the findings (4), indicating that nitroso-MTMC, -BPMC and -MPMC are at least as equally active as nitrosomethylurea in reverting *Salmonella typhimurium* TA1535.

On the other hand, IP administration to male Wistar rats of 43 mg/kg nitroso-MPMC or 200 mg/kg nitroso-MTMC yielded no splitting of single-stranded macromolecular DNA of rat liver *in vivo*, although newly synthesized tritium-labeled macromolecular DNA in rat liver are broken down into several fragments *in vivo* by 40 mg/kg IP of nitrosomethylurea or by 16 mg/kg IP of dimethylnitrosamine (5), as evidenced by appearance of DNA fragments with alkaline sucrose gradient centrifugation of liver homogenate, procedure proposed by COX *et al.* (6).

This might imply poorer interaction of nitrosocarbamates with mammalian DNA *in vivo* than nitrosomethylurea and dimethylnitrosamine.

Dominant lethal test in mice of nitroso-BPMC at 400 mg/kg gave negative results (7).

Recently, EISENBRAND *et al.* (8) reported that single subcutaneous administration of 1000 mg/kg of nitrosocarbaryl in 10% Olivio oil to eight male and eight female rats produced mainly polymorphic-cell sarcomas at the injection site in fifteen animals by day 450. Orally administered single dose of 200 to 1500 mg/kg of the compound has so far induced no tumors (for 21 months). However, they mention in the report that oral administration of 130 mg/kg of nitrosocarbaryl twice a week are developing all stages of malignant transformation in the fore-stomach of the rats, from hyperplasia to squamouscell carcinoma.

Of vital importance from the point of terminal residues is whether or not humans as well as non-target animal species are likely to be exposed.

Therefore, the possibility of actual occurrence of such nitroso compounds in food or feedstuffs as well as of the formation in mammalian body should

be sought.

EISENBRAND *et al.* pointed out (8) that carbaryl in dilute aqueous solution, 1 to 1/10 mmolar, containing 10 or 2% acetic acid, respectively, and with 5-fold molecular excess of nitrite, was transformed to its nitroso derivative. The yield by incubation at 37°C for 60 min under pH 1 was 1.7% of the theoretical. *N*-nitrosocarbaryl is most stable between pH 3 to pH 5 and the half-lives (at 37°C ?) in unbuffered aqueous media containing 20% methanol were 62, 320, 360, 67 and 1.5 min at pH 1, 3, 5, 7.2 and 9, respectively.

In our preliminary experiments (9), the maximum formation rate of nitroso derivative from 0.1 mmolar MTMC with 5 molar excess nitrite during 30 min incubation at 37°C at pH 1.5 (potassium citrate-sulfuric acid buffer) is 16.4%, decreasing with higher pH, down to 2.8% at pH 4. In the artificial stomach juice (pH 1.4) 1.6% of 0.1 mmolar MTMC is converted to its nitroso derivative. In pooled rat stomach juice 1.95% of the nitroso-MTMC was found.

Nitroso MTMC is not so stable under acidic conditions with a half-life of approximately 30 min at 37°C at pH's ranging from 1.5 to 4. At pH 7.5, 16% of the nitroso compound remains after 30 min at 37°C, with the formation of majorly MTMC (19%) and the component *m*-cresol (54%).

The ultimate formation of methyl cation *in vivo* as well as *in vitro* is now under investigation by using $N-^{14}CH_3$ -phenyl carbamates.

References

1. R. K. ELESURU and W. LIJINSKY, *Fd. Cosmet. Toxicol.* **11**, 807 (1973).
2. R. K. ELESURU, W. LIJINSKY and J. K. SETLOW, *Nature* **247**, 386 (1974).
3. M. UCHIYAMA, M. TAKEDA, T. SUZUKI and K. YOSHIKAWA, Speech at the Annual Meeting of Pharmaceutical Society of Japan (March, 1975) *Bull. Environ. Contam. Toxicol.*, in the press.
4. H. SUZUKI and J. MIYAMOTO, unpublished observations (1975).
5. S. HOSOKAWA and J. MIYAMOTO, unpublished observations (1975).
6. R. COX, I. DAMJANOV, S. E. ABANOBI and D. S. R. A. SARMA, *Cancer Res.* **33**, 362 (1973).
7. Mitsubishi Chemical Industries Ltd., private communication (1975).
8. G. EISENBRAND, O. UNGERER and R. PREUSSMAN, *Fd. Cosmet. Toxicol.* **13**, 365 (1975).
9. S. HOSOKAWA, H. YAMAMOTO, H. TABATA and J. MIYAMOTO, unpublished observations (1975).

Appendix VI: Terminal Residues of Dithiocarbamates *

Ethylenethiourea (ETU) is an important residue problem of dithiocarbamates (maneb, zineb, mancozeb, metiram). Recent findings of the behaviour of these ETU residues will be reviewed in this Appendix.

Ethylenethiourea was the subject of several toxicological studies. Besides pronounced thyrotoxic effects (1); mutagenic, teratogenic and carcinogenic effects (1–4) were repeatedly evident. On the basis of recent toxicological data the FAO Working Party of Experts on Pesticide Residues and the WHO Expert Committee on Pesticide Residues (1974 Joint Meeting) recommended establishing a temporary ADI-value of 0.005 mg/kg body weight (previously 0.025) for dithiocarbamates (preliminarily limited in time up to 1977). Simultaneously, tolerance recommendations were given for ETU. The recommended ADI-value is valid as well for ethylene-bis-dithiocarbamate as for dimethyldithiocarbamate (5). The dimethyldithiocarbamates (ferbam, ziram, thiram) also bring about teratogenic effects (6–9), cause chromosome aberrations (10), and in the presence of nitrite, along with the free dimethylamine, produce the carcinogenic nitrosamine (11).

ETU as an *in vitro* degradation product is already present in commercial bis-dithiocarbamate pesticides (12, 13) and is formed during plant (14, 15) and animal metabolism (16). The 5,6-dihydro-3*H*-imidazo (2,1-*c*)-1,2,4-dithiazole-3-thione (DIDT, EBIS, formerly termed ethylenethiuram monosulfide (ETM)), known as a degradation product is also unstable in biological systems. It is further degraded by microorganisms via a reduced unstable intermediate product, whereby ETU, amongst others, occurs as a product (17). After oral application of DIDT to rats, ETU as a main metabolite in the urine was also evident (18).

NEWSOME (19) reported recently on the behaviour of ETU residuals in animal tissues (19); 96 h after a single dose of 20 mg ETU/kg the following residues were found in the tissues of rats and guinea pigs (see Table 1).

Table 1. Residues in tissues 96 h after oral dosing of ETU

<i>Tissue</i>	<i>Rats (ppm ETU)</i>	<i>Guinea pig (ppm ETU)</i>
Liver	0.010 ± 0.005	0.024 ± 0.004
Kidney	0.046 ± 0.004	0.086 ± 0.008
Heart	0.038 ± 0.006	0.038 ± 0.008
Thyroid	0.824 ± 0.042	0.751 ± 0.106
Muscle	0.012 ± 0.000	0.011 ± 0.000

Values are the mean ± S.E. of six animals.

* Continuation of the report submitted to the Commission Meeting in Jealott's Hill, UK, 1 October 1974.

LYMAN (2) showed that a part of the ^{14}C -ETU (dose 1 ppm) fed to milk cows is metabolized. In addition to the formation of ethyleneurea and ethylenediamine, ^{14}C is incorporated into metabolic substances (glycine, oxalic acid, urea, protein, fat, lactose).

PECKA *et al.* (21) described comprehensive investigations of the ETU contamination of commercial plant foods. Of 167 samples analyzed for ETU residues, 110 (65%) did not contain detectable levels and 57 (35%) contained residues ranging from 0.01 to 0.15 ppm. Most (92%) of the samples contained 0.02 ppm or less of ETU; notable exceptions being some samples of canned spinach with an average of 0.047 ppm and orange peels with an average of 0.083 ppm.

NEWSOME *et al.* (22) reported on the dynamics of the residues of maneb, DIDT, ETU and ethylenediamine (EDA). An aqueous suspension of an 80% maneb formulation (Dithane M 22, Rohm and Haas Co.) was applied at a rate of 3 lb/acre in 100 gal. Both beans and tomatoes were sprayed to run-off, $\frac{1}{2}$ gal of the suspension being consumed in the treatment of each crop. Beans received seven treatments and tomatoes eight at intervals of 7 days. Total rainfall during the test period was 4.25 in for beans and 4.61 in for tomatoes. All residue levels declined with time, beans containing more of each compound than tomatoes. After 14 days beans contained the following compounds: maneb, 13; ETU, 0.11; DIDT, 0.25; EDA, 0.09 ppm. The corresponding values for tomatoes were: maneb, 10; ETU, 0.07; DIDT, 0.03; EDA, 0.05 ppm.

Much larger ETU residues were repeatedly found after cooking of crops containing bis-dithiocarbamates (22–25). According to WATTS *et al.* from 10 to 20% of the bis-dithiocarbamates (maneb, mancozeb, metiram) are being degraded to ETU. Higher rates of ETU formation were found by NEWSOME *et al.* (22). Beans sampled 9 days after spraying with maneb (maneb-residues: 25 ppm) and tomatoes obtained 6 days after spraying (residues: 15 ppm) were boiled for 15 min in water. Analysis for ETU showed a total (cooking water + sample) of 11 ppm in beans and 3.2 ppm in tomatoes.

The results demonstrate that the residues of ethylene-bis-dithiocarbamate are a potential source of ETU. Establishing residue limits should be taken into consideration.

Remarks on the Residue Analysis

On account of the occurrence and the hygienic-toxicological importance of the dithiocarbamate metabolites, especially of ETU, a separate determination of bis-dithiocarbamate, ETU and dimethyldithiocarbamate is required.

In addition to the standard method based on the CS₂ formation and suitable for the total determination of all dithiocarbamates, a few specific methods for the determination of bis-dithiocarbamate, ETU and DIDT have been suggested lately. Bis-dithiocarbamate is decomposed by acid hydrolysis to CS₂ and EDA. After chromatographic isolation and formation of derivatives, the free EDA is determined by means of gas chromatography (20, 26). According to NEWSOME (26) the method can be carried out in a manner that the undecomposed bis-dithiocarbamate (with partial co-determination of DIDT and ETU) and free EDA are determined separately.

Different methods were suggested for the determination of ETU residues. Besides semiquantitative chromatographic methods (27, 28, 29) gas chromatographic analysis has been applied repeatedly (21, 27, 30, 31, 32). NASH (32) suggested an improved method with the transformation of the ETU by means of pentafluorobenzoyl chloride (in the place of 1-bromobutane) (27, 30) or anhydride of trifluoroacetic acid into a volatile and, consequently, gas chromatographically detectable derivative. The minimum detectable limit of the method is approximately 0.005 ppm, the yielded recoveries are nearly 100%.

A polarographic method (nitrosation of ETU, measurement of the reduction wave by means of the cathode-ray polarography) was described by ENGST and SCHNAAK (29); its sensitivity is approximately 0.05 ppm. NEWSOME (33) proposed a method for determining DIDT residues in foods by means of gas chromatography. The procedure involves extraction with toluene followed by acid-base cleanup and yielded recoveries generally greater than 90%. The minimum detectable limit was 0.01 ppm. The method completes the polarographic procedure according to ENGST and SCHNAAK (34).

References

1. S. L. GRAHAM *et al.* *J. Agric. Food Chem.* 2 (3), 324 (1973).
2. B. M. ULLAND *et al.* *J. Nat. Cancer Inst.* 49(2), 583 (1972).
3. J. R. M. INNES *et al.* *J. Nat. Cancer Inst.* 42, 1101 (1969).
4. K. S. KHERA, *Teratology* 7(3), 243 (1973).
5. Report of the 1974 Joint Meeting of the FAO Working Party of Experts on Pesticide Residues and the WHO expert Committee on Pesticide Residues, Rome, Dec. 1974.
6. E. A. ANTONOVICH *et al.* *Proceedings on Toxicology and Analytical Chemistry of Dithiocarbamates, Dubrovnik 1971*, pp. 3–22.
7. E. A. ANTONOVICH *et al.*, *Gig. i. Sanitarya* 37(9), 25 (1972).

8. N. ZILOV *et al.*, *Abstr. Bulg. Sci. Med. Lit.*, Sofia **16**(3), p.7, No. 401 (1973).
9. G. MATTHIASCHK, *Arch. Toxicol.*, Berlin **30**(3), 251 (1973).
10. M. A. PILINSKAYA, *Genetika* **7**(6), 438 (1974).
11. G. EISENBRAND *et al.*, *Food Cosmet. Toxicol.* **12**(2), 229 (1974).
12. G. CZEGLÉDI-JANKÓ, *J. Chromatog.* **31**, 89 (1967).
13. W. R. BONTYAN and J. B. LOOKER, *J. Agric. Food Chem.* **21**(3), 338 (1973).
14. R. SATO and C. TOMIZAWA, *Bull Nat. Inst. Agric. Sci.* (Chiba, Japan), Ser. C, **12**, 181 (1960).
15. J. W. VONK and A. KAARS SIJPESTEIJN, *Ann. Appl. Biol.* **65**, 489 (1970).
16. WHO/FAO, *1970 Evaluations of Some Pesticide Residues in Food*, p.407, Rome (1971).
17. J. W. VONK, Thesis, Utrecht (1975).
18. R. ENGST and W. SCHNAAK, unpublished results.
19. W. H. NEWSOME, *Bull. Environm. Contaminat. Toxicol.* **11**(2), 174 (1974).
20. W. R. LYMAN, *Pesticide Terminal Residues* (Symposium, Tel-Aviv, 1971), pp. 243–256 (Butterworths, London, 1972).
21. Z. PECKA *et al.*, *Pesticides Monitoring J.*, in the press.
22. W. H. NEWSOME *et al.*, *J. Agric. Food Chem.*, in the press.
23. R. R. WATTS *et al.*, *Bull. Environm. Contaminat. Toxicol.* **12**(2), 224 (1974).
24. R. ENGST and W. SCHNAAK, Paper presented at Third International Congress of Pesticide Chemistry Helsinki, July 1974, in the press.
25. W. H. NEWSOME and G. W. LAVER, *Bull. Environm. Contaminat. Toxicol.* **10**(3), 151 (1973).
26. W. H. NEWSOME, *J. Agric. Food Chem.* **22**(5), 886 (1974).
27. J. H. ONLEY and G. JIP, *J. Assoc. Offic. Anal. Chem.* **54**, 165 (1971).
28. C. H. BLASQUES, *J. Agric. Food Chem.* **21**(3), 330 (1973).
29. R. ENGST and W. SCHNAAK, *Nahrung* **18**, 597 (1974).
30. L. D. HAINES and I. L. ADLER, *J. Assoc. Offic. Anal. Chem.* **56**(2), 333 (1973).
31. W. H. NEWSOME, *J. Agric. Food Chem.* **20**(5), 967 (1972).
32. R. G. NASH, *J. Assoc. Offic. Anal. Chem.* **57**(5), 1015 (1974).
33. W. H. NEWSOME, *J. Agric. Food Chem.* **23**(2), 348 (1975).
34. R. ENGST and W. SCHNAAK, *Z. Lebensmittel-Unters. u.-Forsch.* **144**, 81 (1970).

Appendix VII: Terminal Residues of Dithiocarbamate Fungicides

This Appendix is complementary to that of ENGST and also presents some results from our own experiments.

VONK's (1) dissertation on 'Chemical decomposition of bisdithiocarbamate fungicides and their metabolism by plants and microorganisms' is a comprehensive presentation of the present state of knowledge on the subject. A total of 117 references are examined critically, and a number of results from his own experimental work are reported.

One chapter is devoted to the reexamination of the structure of 'ETM'. Spectroscopic measurements of highly purified ETM as well as detailed studies of an ETM-CS₂ adduct prove conclusively that the structure is 5,6-dihydro-3*H*-imidazo [2,1-*c*]-1,2,4-di-thiazole-3-thione. We would recommend bringing into general use the term DIDT for this compound as suggested by the author.

VONK then reports in detail on *in vitro* and *in vivo* studies with ¹⁴C-nabam, on the fate of ETU in cucumbers and on the microbial degradation of nabam, ETU and DIDT. ETU when applied to roots of cucumber or wheat seedlings was readily taken up, in contrast to DIDT. 2-Imidazoline and EU were detected in the plants, both were formed directly from ETU.

The work is concluded with a discussion on the conversion reactions of bisdithiocarbamates in plants and the part played by microorganisms.

A literature review (24 references) dealing with decomposition (hydrolysis, oxidation, metabolism in plants and soil) of dithiocarbamate fungicides has been published by KOROTKOWA (2). Furthermore, this group of chemicals is discussed with regard to their toxicity. The data indicate that dithiocarbamate derivatives are quite rapidly decomposed in the external environment.

The rate of conversion of methane sodium to methylisothiocyanate in soil was investigated by LEISTRA *et al.* (3). Rate of conversion depended on temperature and soil type and normally was completed within a few hours. Methylisothiocyanate diffusion to depths greater than 30 cm was very slow.

HELLING *et al.* (4) studied the fungicide mobility in soils by means of bioassay methods in combination with soil thin-layer chromatography. The movement of ferbam, thiram, ziram, maneb, nabam and zineb was generally characterized by complex patterns of both fungitoxic and stimulatory zones in the chromatograms. Streaking was observed with all compounds except zineb, which was immobile and apparently free of bioactive contaminants. Maneb showed limited streaking. Experiments with ¹⁴C-labelled nabam,

maneb and zineb in five soils showed that movement was inversely related to soil organic matter content.

Uptake, translocation and metabolism of ^{14}C -ETU in plants was studied by HOAGLAND and FREAR (5). ETU was absorbed readily by roots and petioles of corn, pepper, lettuce and tomato and rapidly translocated within the plant. The estimated half-life was about 1 day. After 20 days, only 1–2% of the treatment dose remained as ETU. Plants evolved minor quantities of $^{14}\text{CO}_2$. One major degradation product was tentatively identified as EU.

Breakdown of ETU has been studied in our laboratory (6). Two soil samples (No. 1 org. C 2.6%; pH 6.8; particle size <0.02 mm 10.1%; No. 2 org. C 1.0%; pH 5.2; particle size <0.02 mm 19.5%) were fortified with pure ETU (3.8 ppm) and stored at room temperature. Analyses were run at 0, 3, 24, 72 and 144 hours after fortification. No ETU residues were found after 144 hours. From the degradation curves the half-life could be estimated to be 8 hours in soil No. 1 and 12 hours in soil No. 2.

Degradation of metiram, methylmetiram and maneb in the two above-mentioned soils was also investigated in our laboratory. Soils were fortified with 10 ppm of the respective fungicides. We obtained the following results:

Metiram: Residues <0.5 ppm in soil No. 1, 14 days after fortification but 2.5 ppm (25%) was present in soil No. 2, 28 days after fortification.

Methylmetiram: No detectable residues in either soil 6 days after fortification.

Maneb: 14 days after fortification 14% of the initial amount was detectable in soil No. 1 and 25% in soil No. 2. These figures indicate a rapid breakdown of these compounds in soil. However, according to our findings, we were not able to estimate the half-life of these fungicides.

Soil tube leaching studies have been carried out with methylmetiram and maneb. Application rate was 50 kg/ha. Three different soils were used. The amount of 'rain' was 200 mm applied within 24 hours. No leaching was observed with methylmetiram and only traces (2% of the amount applied) of maneb could be detected, and that only in a very light sandy soil.

References

1. J. W. VONK, Dissertation, Rijksuniversiteit, Utrecht (1975).
2. O. A. KOROTKOVA, Decomposition of Fungicides which are Dithiocarbamic Acid Derivatives (Russ.). *Khim. Sel. Khoz.* 12, 869–74 (1974).

3. M. LEISTRA *et al.*, Conversion of Methane-sodium to Methylisothiocyanate and Basic Data on the Behavior of Methylisothiocyanate in Soil after Injection of Metam-sodium. *Pesticide Sci.* **5**, 401–07; 409–17 (1974).
4. C. S. HELLING *et al.*, Fungicide Movement in Soils. *Phytopathology* **64**, 1091–1100 (1974).
5. R. E. HOAGLAND and D. S. FREAR, Behavior and Fate of Ethylene-thiourea in Plants. *Abstr. Papers Am. Chem. Soc. 166 Meet.* Pest 4 (1973).
6. N. DRESCHER and S. OTTO, unpublished results.

Appendix VIII: Carbendazim (BCM)

Studies on the degradation of carbendazim in soil are reported. Also included are sections on leaching behaviour and the possibility of uptake of residues from the soil by subsequent crops.

1. Degradation in Soil. The investigations were carried out with two soils that are characterized as follows:

No. 1 org. C 2.6%, pH 6.8, particle size <0.02 mm 10.1%

No. 2 org. C 1.0%, pH 5.8, particle size <0.02 mm 19.5%

Soil sample No. 1 was fortified with 3 ppm ^{14}C -BCM while 3 ppm cold BCM was added to soil No. 2. The soils were kept at ambient temperature, and evaporated water was replaced by the addition of distilled water. Samples were analysed at intervals over a period of 380 days. With the aid of the degradation curves, a half-life of about 40 days could be calculated.

The soil extracts from the trial with radioactive labelled BCM were separated by thin-layer chromatography (t.l.c.) and examined with a t.l.c. scanner at 0, 55 and 85 days. Only unchanged compound was detected. Minute quantities of radioactivity were to be found at the origin of the chromatograms of the samples at 55 and 85 days, but they were insufficient to attempt identification. There are, however, indications that BCM — at least in part — is incorporated into the organic fraction of the soil.

2. Leaching of BCM. The investigations were carried out in 30-cm soil columns with three different soil types. BCM was applied to the surface of the soil at a rate of 2.5 kg/ha. 200 mm 'rain' was sprinkled into the soil over a 24-hour period. No carbendazim was detectable in the leachates, indicating that this compound is very readily absorbed by soils.

3. In order to obtain information on the possible uptake of BCM residues from the soil by subsequent crops, further experiments were carried out on the soil treated with radioactive labelled BCM:

240 days after the start of the trial, soil No. 1 contained 2 ppm total activity, of which 0.2 ppm was unchanged compound. Lettuce and radishes were then sown in this soil and were grown in a growth chamber. Samples were taken 30 and 84 days after sowing, and the radioactivity was measured.

The results are shown in Table 1.

Table 1

	<i>Days after planting</i>	<i>No. of plants</i>	<i>Total radio- activity (ppm)</i>	<i>Extractable radioactivity (ppm)</i>
Lettuce	38	4	0.014	0.016
	84	2	0.033	0.019
Radishes	38	8	0.011	0.001
Roots	84	10	0.016	0.005
Leaves	84	10	0.016	0.005

From these results it can be concluded that uptake of BCM residues by lettuce and radishes is negligible.

Appendix IX: Chemical Nature of the Terminal Residues of Herbicides

Carbamates

Propham. Isopropyl carbanilate (propham, iPC) is generally metabolized in soil by a cleavage of the carbanilate bond to yield aniline, isopropyl alcohol and CO₂. McCLURE (1) demonstrated that microorganisms grew and respired on nonchlorinated aniline herbicides, but ring chlorination depressed respiration and inhibited growth. Hydrolysis of the side chain (yielding the corresponding aniline derivative) followed by metabolic degradation of the phenyl ring could be shown in a number of cases.

Propham is taken up by root-treated soybean plants and is rapidly metabolized to a number of polar products and non-extractable residues.

Propham polar metabolites, isolated and characterized from soybean shoot and root, were shown to be conjugates of 2-hydroxy-propham (isopropyl-2-Hydroxycarbanilate) (see Chart 1). At least in part, the compound is conjugated as a glucoside (2a). A similar pathway was found for chlorpropham (CIPC) (2b).

Chickens yielded urinary metabolites ring hydroxylated at 3- or 4-positions, while in mammals the predominant site of aryl hydroxylation was at the 4-position, with a minor portion found as the 3,4-dihydroxy-carbanilate and

2-hydroxy-carbanilate conjugates (glucuronide). The 2-hydroxy-carbanilate conjugate was found only in goat and could have been a result of microbial hydroxylation. These urinary metabolites were found as sulfate and glucuronide esters and in some cases as methoxy derivatives (3, 4). Hydroxylation or complete cleavage of the carbamate side-chain has also been reported to occur in animals.

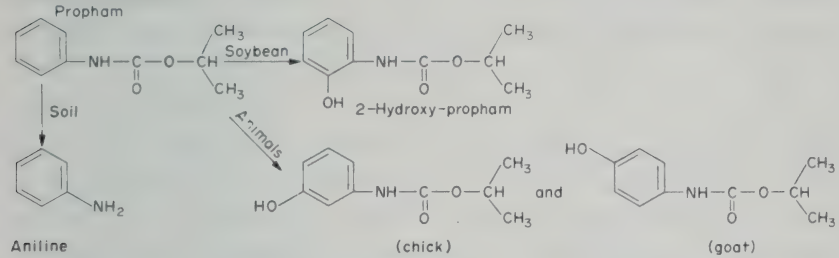


Chart 1

Summarizing the following scheme can be given:

Organism	Metabolites
Plants	Ring hydroxylation on side 2, followed by glucosidation
Soil	Aniline derivative
Animals	Side chain cleavage
	Side chain hydroxylation
	Ring hydroxylation on sides 2, 3, 4 (glucuronic acid conjugation)
	Ring hydroxylation on sides 2 or 4 (sulfate ester formation)
	Ring hydroxylation on side 3 (methoxy derivative)

Urea Herbicides

Siduron. New information is available on the fate of siduron [3-phenyl-l-(2-methylcyclohexyl)urea] in plants. Siduron undergoes hydroxylation on both the phenyl and methylcyclohexyl substituents. On the latter hydroxylation may occur on either the ring or methyl group. The hydroxylation of siduron is followed by conjugation (most likely glucoside) (5).

Hydroxylation of the cyclohexyl ring has also been reported to occur in dogs. However, dogs did not hydroxylate the methyl group of siduron (6). In soil the same hydroxylated metabolites were found as in dogs (7) (see

Chart 2). No data are available about the possible occurrence of the free aniline derivative in soil.

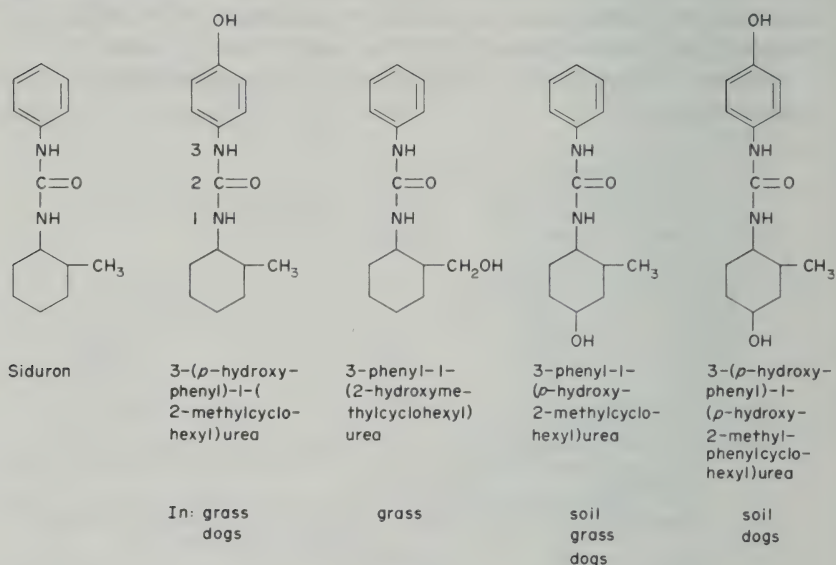


Chart 2

Monuron. Evidence is now available on the glucosidation of monuron in plants (see Chart 3). The demethylated and/or hydroxylated parent compound conjugates with glucose (8, 9). Ring hydroxylation followed by glucosidation has been shown by LEE and FANG (9).

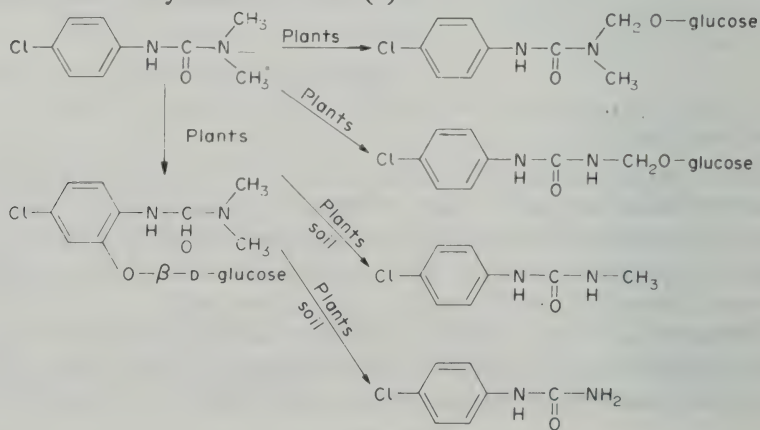


Chart 3

Pure cultures of soil organisms are able to demethylate monuron (10). On the other hand, degradation of urea herbicides by soil micro-flora may occur by cleavage of the amide bond resulting in the corresponding anilines. Whether phenylurea-derived anilines are bound to lignin or humic acid-type constituents as is known to occur with the aniline containing fungicide carboxin remains to be investigated (11, 12). In plants, complex formation between monuron and polypeptides has been reported, yielding unchanged parent compound upon acid hydrolysis (9).

Dinitroaniline Herbicides

Dinitramine. Dinitramine (N^3 , N^3 -diethyl 2,4-dinitro-6-(trifluoromethyl)-*m*-phenylenediamine) is a new selective pre-emergence herbicide that is incorporated in the soil in order to control annual grasses and broad-leaved weeds. The compound is strongly adsorbed to soil and demethylated. Demethylation is followed by ring closure under formation of a benzimidazole derivative (see Chart 4). Nitro-group reduction was not observed. The production of benzimidazole compounds constitutes a new additional pathway for microbial metabolism of this group of herbicides (13, 14). The dealkylated product has also been identified (14).

Dinitramine accumulates in fish after brief exposures to low concentrations (15).

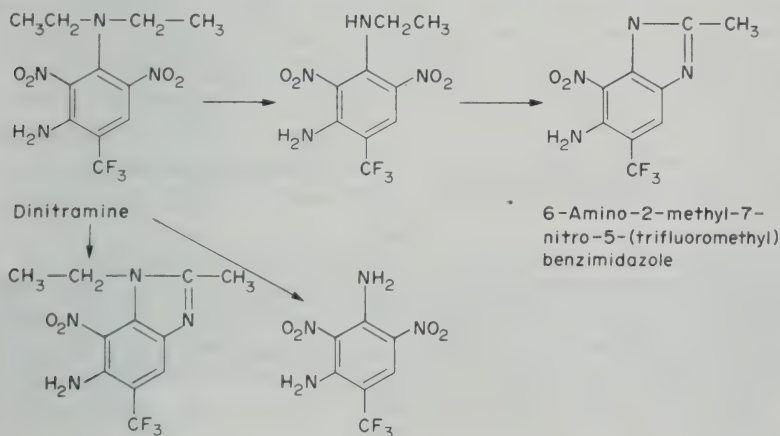


Chart 4

It should be mentioned that benzimidazole derivatives are highly persistent in soil (16).

N-sec-butyl-4-*tert*-butyl-2,6-dinitroaniline. This herbicide is a new member of the dinitroaniline class of herbicides. As is the case with other dinitroanilines with increase in clay content, the amount needed for weed control varies with the soil type. Persistence depends on soil type. Leaching studies have shown only slight movement of the parent compound from the soil surface (17). Major metabolite from the fungus *Paecilomyces* sp. was an oxygenated analog and was identified as 3-(4-*tert*-butyl-2,6-dinitroanilino)-2-butanol (see Chart 5). This fungus did not oxidize this compound to a dealkylated product. The latter product, however, was isolated from soils fortified with the parent compound (18).

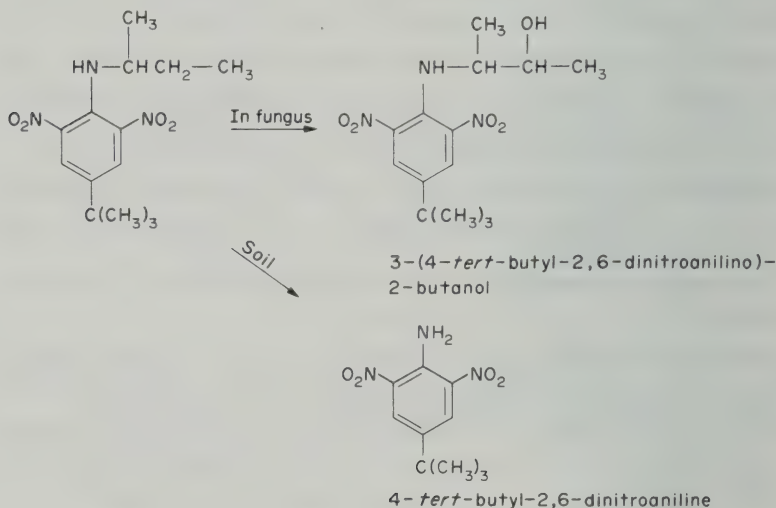


Chart 5

Isopropalin. Field soil studies showed biodegradation of ^{14}C -isopropalin (2,6-dinitro-*N,N*-dipropylcumidine). After 15 months, *ca.* 25% of applied isopropalin remained in soil and less than 10% was observed after 28 months in Crosby silt loam (average annual rain fall 100 cm). Only negligible amounts of radioactivity were detected in peppers, tobacco and tomato grown in treated soil.

The proposed pathway for the breakdown of isopropalin is in basic agreement with that of trifluralin and benfen (reduction of nitro groups, dialkylation of isopropyl groups). In addition benzimidazole derivatives (see Chart 6)

have been detected which were bound to soil particles (19). Persistence of trifluralin, benefin and nitralin 15 months after soil application has been reported (20).

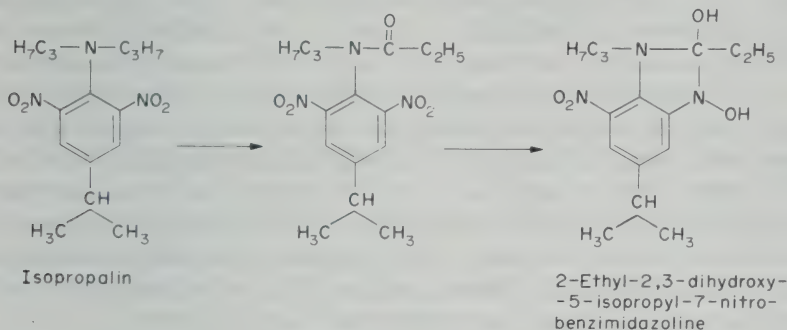


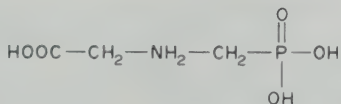
Chart 6

Organic Phosphorus Herbicide and Growth Regulators

Glyphosate. *N*-(phosphonomethyl) glycine is a nonselective post-emergence herbicide. It has no herbicidal activity when applied to soil. The compound is adsorbed to clay or organic matter through the phosphonic acid moiety. The limited glyphosate mobility is influenced by pH and soil type, whereby increasing phosphate levels in the soil decreased glyphosate adsorption. It is further reported that the adsorption mechanism is not so much determined by the cation exchange capacity but rather by the type of cation on the clay-mineral (21, 22).

The initial step in the inactivation of ^{14}C -glyphosate appeared to be rapid binding to soil. This is followed by microbial breakdown under the release of $^{14}\text{CO}_2$.

The compound is taken up by the leaves of both mono- and dicotyledons and translocated to rhizomes and untreated shoots (23). Pathways for breakdown in plants and soil are not fully known. Studies with ^{14}C -glyphosate showed that plants metabolize the product into CO_2 and natural organic products (24).



Ethephon. 2-Chloroethylphosphonic acid is a growth-regulating chemical which gives a variety of biological responses including acceleration of fruit abscission. A method for determination of residue analysis of ethephon on apples and cherries has been developed by BACHE (25). Studies on the fate of ^{14}C ethephon are hampered by the presence of impurities in the samples (26). Ethylene is the main decomposition product from ethephon. Evidence has been presented for the non-enzymatically binding of ethephon to some constituents in extracts of peach fruits, particularly to sugars (26). The presence of a metabolite in leaves of cherry was indicated by t.l.c. and autoradiography. Most probably the metabolite contained an intact phosphonic acid group (27). According to ARCHER *et al.* (28, 29) ethephon is converted into at least thirteen compounds other than ethylene in leaf and stem tissue of *Hevea brasiliensis*. A minor component of the products is probably 2-hydroxyethylphosphonic acid (HEPA) (see Chart 7).

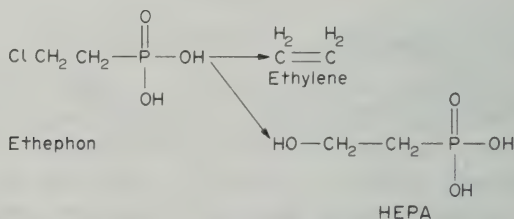


Chart 7

References

1. G. W. McCLURE, *Weed Science* **22**, 323–329 (1974).
- 2.(a) G. G. STILL and E. R. MANSAGER, *Pestic. Biochem. Physiol.* **3**, 289–299 (1973).
- 2.(b) G. G. STILL and E. R. MANSAGER, *Pestic. Biochem. Physiol.* **3**, 87–95 (1973).
3. G. D. PAULSON, M. M. DOCKTOR, A. M. JACOBSEN and R. G. ZAYLSKIE, *J. Agric. Food Chem.* **20**, 867–876 (1972).
4. G. D. PAULSON, A. M. JACOBSEN and R. G. ZAYLSKIE, *J. Agric. Food Chem.* **21**, 804–810 (1973).
5. L. S. JORDAN, A. A. ZURQIYAH, A. R. de MUR and W. A. CLERX, *J. Agric. Food Chem.* **23**, 286–288 (1975).
6. J. BELASCO and R. W. REISER, *J. Agric. Food Chem.* **17**, 1000–1003 (1969).

7. J. BELASCO and W. P. LANGSDORF, *J. Agric. Food Chem.* **17**, 1004–1007 (1969).
8. D. S. FREAR and H. R. SWANSON, *Phytochem.* **11**, 1919 (1972).
9. S. S. LEE and S. C. FANG, *Weed Res.* **13**, 59–66 (1973).
10. P. R. WALLNÖFER, S. SAFE and O. HUTZINGER, *Pestic. Biochem. Physiol.* **3**, 253–258 (1973).
11. M. SNEL and L. V. EDGINGTON, *Phytopathology* **69**, 1708 (1970).
12. W. T. CHIN *et al.*, *J. Agric. Food Chem.* **18**, 731–732 (1970).
13. T. L. LAANIO, P. C. KEARNEY and D. D. KAUFMAN, *Pestic. Biochem. Physiol.* **3**, 271–277 (1973).
14. R. SMITH, W. S. BELLES, K. W. SHEN and W. G. WOODS, *Pestic. Biochem. Physiol.* **3**, 278–288 (1973).
15. L. E. OLSON, J. L. ALLEN and W. L. MAUCK, *J. Agric. Food Chem.* **23**, 437–439 (1975).
16. N. AHARONSON and U. KAFKAFI, *J. Agric. Food Chem.* **23**, 434–437 (1975).
17. A. H. FURRER, S. R. McCLANE and R. M. DRYDEN, Annual Meeting, Northeastern Weed Science Soc. New York, January (1971).
18. P. C. KEARNEY *et al.*, *J. Agric. Food Chem.* **22**, 856–859 (1974).
19. T. GOLAB and W. A. ALTHAUS, *Weed Science* **23**, 165–171 (1975).
20. J. H. MILLER *et al.*, *Weed Science* **23**, 211–214 (1975).
21. P. SPRANKLE, W. E. MEGGITT and D. PENNER, *Weed Science* **23**, 224–228 (1975).
22. P. SPRANKLE, W. E. MEGGITT and D. PENNER, *Weed Science* **23**, 229–234 (1975).
23. P. SPRANKLE, *Weed Science* **23**, 235–240 (1975).
24. *Herbicide Handbook of the Weed Science Soc. of America*, 3 ed. (1974).
25. C. A. BACHE, *J. Assoc. Off. Anal. Chem.* **53**, 730–732 (1970).
26. S. LAVEE and G. C. MARTIN, *J. Amer. Soc. Hort. Sci.* **100**, 28–31 (1975).
27. M. D. GILBERT *et al.*, *J. Agric. Food Chem.* **23**, 290–292 (1975).
28. B. L. ARCHER, B. G. AUDLEY and N. P. MANN, *Phytochemistry* **12**, 1535–1538 (1973).
29. B. G. AUDLEY and B. L. ARCHER, *Chem. and Ind.* 634–635 (1973).

Appendix X: The Photodecomposition of Organophosphorus Pesticides

Despite the continuing worldwide importance of organophosphorus compounds in pest control, remarkably little definitive work has been

published on their photodecomposition. In the environment, they are exposed to 'weathering' — air, water and other nucleophiles, surfaces, and light of wavelengths above 300 nm — and should be susceptible to the same light-energized oxidations, reductions, displacements and other reactions which so often affect environmental contaminants (1).

KENAGA and END (2) list 94 commercial and experimental organophosphorus insecticides, acaricides and nematocides, and several more are used as herbicides or plant-growth regulators. The largest number (31) are phosphorothionates (PS—O) typified by parathion, while the 7 phosphorothiolates (PO—S), 25 phosphorodithioates (PS—S), 15 phosphates (PO—O), and 22 others such as phosphonates and phosphoramidates make up the remainder. Most may be represented as a polarized alkoxyphosphoryl portion attached to a characteristic electropositive portion by a high energy bond.

Considering parathion as a typical example, the organophosphorus esters undergo spontaneous hydrolysis in water at rates depending primarily on the pH of the medium and the electronegativity of the alcohol or phenol (3), and they likewise can phosphorylate nucleophiles other than water (4). The coordinate-covalent P—S bond of phosphorothionates and phosphorodithionates is oxidized to P—O by ionic agents such as peracids or hypochlorite (5). Phosphorus esters, especially the phosphorothiolates, alkylate amines, alcohols, thiols and a variety of other nucleophiles (6), and the sulfur-containing esters also self-alkylate ('isomerize'), most commonly to convert a phosphorothionate (such as parathion) to an isomeric phosphorothiolate. In addition to the reactions of the phosphorus-containing end of the molecule, the electropositive end can independently undergo the oxidation, reduction and other reactions characteristic of its own functional groups (for example, chemical reduction of parathion's nitro group to the corresponding amine).

Photochemical Reactions. Reports on the effects of light on organophosphorus pesticides first appeared in the early 1950s, and much of the subsequent work was done with parathion. COOK and PUGH (7) and others observed its photochemical hydrolysis to *p*-nitrophenol and oxidation to paraoxon; isomerization to the *S*-alkyl isomer was enhanced by light (8); and the aromatic nitro group was reduced (SANDI, 1958) under ultraviolet (u.v.) irradiation.

Although light and air long have been known to degrade organophosphorus pesticides under laboratory conditions to mixtures containing the oxon (8, 9), it was not until the elegant investigation of fenitrothion (Sumithion) by OHKAWA, MIKAMI and MIYAMOTO (10) that oxon formation was directly

linked to atmospheric oxygen by observing its absence after irradiation in a nitrogen atmosphere. Laboratory studies also have revealed photochemical oxon formation with diazinon (11) and methidathion (Supracide) (12). However, GRUNWELL and ERICKSON (13) showed that paraoxon could be obtained by u.v. irradiation of its apparently anaerobic solutions and suggested that water was involved in oxon formation. Neither ground-state nor singlet oxygen alone had any effect, and there is an increasing possibility that externally generated, ionic oxidants ('sensitizers') may be responsible for many PS-PO conversions (1). A variety of pesticides and other agents also act as photosensitizers for organophosphorus transformations (usually on a silicic acid surface) and oxons are prominent products (10, 14).

'Photohydrolysis' has been demonstrated with a number of simple phosphorus esters (15), but apparently no comparison measurements between hydrolysis rates in light and dark have been reported for pesticides. However, photolytic formation of the corresponding phenols from parathion (13), fenitrothion (10) and several other insecticides in water when little or none was observed in the dark indicates that light-activated hydrolysis exists. Aliphatic ester groups also undergo 'photohydrolysis' in sunlight or ultraviolet light (16), but the products resulting from irradiation of ethylphosphoric acid in water, for example, proved to be acetaldehyde, hydrogen and phosphoric acid (17) rather than the expected alcohol.

The light-energized hydrolysis of nitrophenylphosphoric acid to the corresponding nitrophenol and phosphoric acid proved equally surprising chemically; HAVINGA and his coworkers (18) demonstrated that it involves a photonucleophilic displacement of orthophosphate from the aromatic ring by hydroxide ion. Consequently, irradiation of a solution of *m*-nitrophenyl phosphate in the presence methylamine produced primarily *m*-nitro-*N*-methylaniline; similar photonucleophilic reactions are known elsewhere in the pesticide field (19). Irradiation of aqueous phenylphosphoric acid gave primarily resorcinol, hydrogen and phosphoric acid by a so-far unexplained mechanism (20).

Irradiation of pesticides sometimes produces unexpected aliphatic phosphate triesters explicable only by photoalkylation reactions [e.g. GRUNWELL and ERICKSON (13)]. However, light-induced auto-alkylations leading to pesticide isomers have been observed in a number of instances — methylparathion (21), parathion (8) and fenitrothion (10), for example — and this bimolecular reaction, which occurs even in the absence of light, is well known (6).

The electropositive ester groups represent a wide variety of chemical types, only a few of which have received photochemical attention. Among the aliphatics, the *trans* isomer of mevinphos (Phosdrin) was partially converted to *cis*-isomer in the u.v. light (22), and polar photolysis products of demeton (Systox) isomers isolated by COOK (23) probably were sulfoxides or sulfones resulting from side-chain thioether oxidation. In aromatic systems, the ring-methyl group of fenitrothion was oxidized to carboxyl (10), the parathion nitro group reduced to amine (SANDI, 1958), the diphenyl sulfide grouping of abate oxidized to sulfoxide and sulfone (24), and the trichloropyridine ring of chlorpyrifos (Dursban) reductively dechlorinated (25).

Terminal Residues. COOK (26) and COOK and OTTES (1959) found that a wide variety of pesticides [e.g. carbophenothion (Trithion), ethion, phorate (Thimet), malathion and trichlorphon (Dipterex, Dylox)] were converted to both more polar and less polar products on paper, glass, or leaf surfaces by u.v. or sunlight. Cook states 'this phenomenon is very spectacular; short periods of exposure (10–20 min) to a germicidal lamp converted small quantities (2–4 mmg) almost completely'. Once formed, the 'new and potent anticholinesterases' often were tightly bound to the surface. FRAWLEY *et al.* (27), noted that the products from parathion likewise showed increased cholinesterase inhibition but decreased acute toxicity to houseflies, all of which suggests a process of auto-alkylation to new series of isomeric oxons (thiolates). There seems to be little published toxicological information relating to either the *S*-substituted isomers or the bound anticholinesterase residues, except that the former are stronger cholinesterase inhibitors than the parent pesticides (Table 1) (28).

Table 1. Cholinesterase inhibition by phosphorothionate isomers

Pesticide (RO) ₂ P(S)-OR'	<i>pI</i> ₅₀	Isomer	<i>pI</i> ₅₀	Enhancement
Methylparathion	2	(RO) ₂ P(O)-SR'	6.5	3 × 10 ⁴
Parathion	4	(RO)(RS)P(O)-OR'	6	100
		(RO) ₂ P(O)-SR'	8.6	4 × 10 ⁴
		(RO) ₂ P(O)-SR	8.6	4 × 10 ⁴
Demeton	3.7	(RO) ₂ P(O)-SR'	5.5	80
Oxydemeton	5.5	(R) ₂ P(O)-SR'	5.8	2
Malathion	2	(RO)(RS)P(O)-SR'	4.5	300

Oxon formation on leaf surfaces also is well documented [e.g. for dime-thoate (29), fensulfothion (30), fenitrothion (10), ethion and zolone (31) and azinphosmethyl (32)]. JOINER and BAETCKE (33) observed that

photodecomposition of parathion gave the *S*-*p*-nitrophenyl isomers, paraoxon, and *p*-nitrophenol on cotton foliage, and EL-RAFAI and HOPKINS (34) reported a similar conversion on bean leaves as well as on glass plates, leading to the implication of photolysis products in incidents of farm-worker poisoning. On typical leaf surfaces (33) only about one-fifth of the field-applied parathion could be accounted for one week after treatment, 60% of it as an unidentified and highly polar residue. Of the identifiable remainder, about 70% was parathion, 20% paraoxon, 5% *p*-nitrophenol and, in succeeding weeks, increasing quantities of parathion isomers. Similar results were reported for fenitrothion on bean leaves (10).

Considering the relatively high vapor pressures of parathion and its photo-products, a large proportion of the missing substances probably moved into the atmosphere, where laboratory studies indicate they are completely stable in vapor form (35). Similarly, parathion (13) and fenitrothion (10) provided only low levels of oxon or phenol when irradiated in water, although the known instability of nitrophenols to reduction and photonucleophilic displacement under these conditions (36) may account for the observed loss of the pesticides. It is becoming apparent that the photochemical reactions of organophosphorus pesticides take place primarily on surfaces — glass, leaves, and dusts or other adsorbents — although the mechanisms are not clear (35). Also, the impact of photosensitization on terminal residues has not been evaluated.

Photochemical action appears to be responsible for a major proportion of the environmental degradation of organophosphorus pesticides and for the nature of many persistent terminal residues. While the levels of parent compounds and their cholinesterase-inhibiting oxons and isomers on food plants obviously require consideration, little attention has been paid to the other products of non-biological breakdown. The high toxicity of *p*-nitrophenol, for example, and the recent report of synergism between malathion and simple phosphate ester photoproducts such as *O,O,S*-triethyl thiophosphate (37) suggest that the toxicological importance of organophosphate photodecomposition has not yet been fully realized.

References

1. D. G. CROSBY, *Ann. Rev. Plant Physiol.* **24**, 467 (1973).
2. E. E. KENAGA and C. S. END, *Commercial and Experimental Organic Insecticides*, Ent. Soc. America, Special Publ. 74-1, College Park, Md., 1974.

3. C. FEST and K. J. SCHMIDT, *The Chemistry of Organophosphorus Pesticides*, Springer, New York, 1973.
4. V. M. CLARK, D. W. HUTCHINSON, G. W. KIRBY and S. G. WARRENT, *Angew. Chem. Int. Ed. English* **3**, 678 (1964).
5. D. A. WUSTNER, M. A. FAHMY and T. R. FUKUTO, *Residue Rev.* **53**, 53 (1974).
6. G. HILGETAG and H. TEICHMANN, *Angew. Chem. Int. Ed. English* **4**, 914 (1965).
7. J. W. COOK and N. D. PUGH, *J. Assoc. Offic. Agric. (Anal.) Chem.* **40**, 277 (1957).
8. P. KOIVISTOINEN and M. MERILAINEN, *Acta Agric. Scand.* **12**, 267 (1962).
9. P. KOIVISTOINEN, *Acta Agric. Scand.* **12**, 285 (1962).
10. H. OHKAWA, N. MIKAMI and J. MIYAMOTO, *Agric. Biol. Chem.* **38**, 2247 (1974).
11. J. R. PARDUE, E. A. HANSON, R. P. BARRON and J. Y. T. CHEN, *J. Agric. Food Chem.* **18**, 404 (1970).
12. W. P. DEJONCKHEERE and R. H. KIPS, *J. Agric. Food Chem.* **22**, 959 (1974).
13. J. R. GRUNWELL and R. H. ERICKSON, *J. Agric. Food Chem.* **21**, 929 (1973).
14. G. W. IVIE and J. E. CASIDA, *J. Agric. Food Chem.* **19**, 405, 410 (1971).
15. M. HALMAN, in *Topics in Phosphorus Chemistry* (M. GRAYSON and E. J. GRIFFITH, eds.), Interscience, New York, 1967.
16. E. BAMAN, K. GUBITZ and H. TRAPMAN, *Arch. Pharm.* **4**, 240 (1961).
17. M. HALMAN and I. PLATZNER, *J. Chem. Soc.* **1965**, 1440, 5380.
18. E. HAVINGA and M. E. KRONENBERG, *Pure Appl. Chem.* **16**, 137 (1968).
19. D. G. CROSBY, K. W. MOILANEN, M. NAKAGAWA and A. S. WONG, in *Environmental Toxicology of Pesticides* (F. MATSUMURA, G. M. BOUSH and T. MISATO, eds.), Academic, New York, 1972, p. 423.
20. M. HALMAN and I. PLATZNER, *Israel J. Chem.* **2**, 75 (1964).
21. R. L. METCALF and R. B. MARCH, *J. Econ. Entomol.* **46**, 288 (1953).
22. J. E. CASIDA, *Science* **122**, 597 (1955).
23. J. W. COOK, *J. Assoc. Offic. Agric. (Anal.) Chem.* **37**, 989 (1954).
24. J. D. ROSEN, in *Environmental Toxicology of Pesticides* (F. MATSUMURA, G. M. BOUSH and T. MISATO, eds.), Academic Press, New York, 1972, p. 435.

25. G. N. SMITH, *J. Econ. Entomol.* **61**, 793 (1968).
26. J. W. COOK, *J. Assoc. Offic. Agric. (Anal.) Chem.* **38**, 826 (1955).
27. J. P. FRAWLEY, J. W. COOK, J. R. BLAKE and O. G. FITZHUGH, *J. Agric. Food Chem.* **6**, 28 (1958).
28. R. D. O'BRIEN, *Toxic Phosphorus Esters*, Academic, New York, 1960.
29. W. C. DAUTERMAN, G. B. VIADO, J. E. CASIDA and R. D. O'BRIEN, *J. Agric. Food Chem.* **8**, 115 (1960).
30. E. BENJAMINI, R. L. METCALF and T. R. FUKUTO, *J. Econ. Entomol.* **52**, 94 (1959).
31. J. T. LEFFINGWELL, R. C. SPEAR and D. JENKINS, *Arch. Environ. Contam. Toxicol.* **3**, 40 (1975).
32. W. L. WINTERLIN, C. MOURER and J. B. BAILEY, *Pest. Monitor J.* **8**, 59 (1974).
33. R. L. JOINER and K. P. BAETCKE, *J. Agric. Food Chem.* **21**, 391 (1973).
34. A. EL-REFAI and T. L. HOPKINS, *J. Agric. Food Chem.* **14**, 588 (1966).
35. K. W. MOILANEN and D. G. CROSBY, *Environ. Qual. Safety*, in press (1975).
36. M. NAKAGAWA and D. G. CROSBY, *J. Agric. Food Chem.* **22**, 849 (1974).
37. G. PELLEGRINI and R. SANTI, *J. Agric. Food Chem.* **20**, 944 (1972).

COMMISSION ON PESTICIDE RESIDUE ANALYSIS (VI.5.2)

4–5 September 1975

Present: Dr. H. FREHSE (Chairman), Prof. P. KOIVISTOINEN (Secretary), Dr. V. BÁTORA, Dr. K. R. HILL, Prof. G. WIDMARK (Titular Members); Mr. K. E. ELGAR, Mr. S. G. HEUSER, Dr. Ch. RESNICK (Associate Members). Attended by invitation: Dr. R. L. BARON, Dr. N. DRESCHER, Mr. M. J. EDWARDS, Prof. R. ENGST, Dr. H. GEISSBÜHLER, Dr. J. MIYAMOTO, Dr. E. E. TURTLE (FAO).

1. Minutes of Previous Meeting

The minutes of the eighth meeting of the Commission, held in Bracknell (UK) on 3 October 1974 [see *Inf. Bull.* Nos. 50/51 (November 1975), pages 75–103] were approved.

2. Matters Relating to Publications

Dr. FREHSE stressed that attention should be paid to IUPAC style and format while preparing working papers of the Commission. The Meeting was reminded that the papers should be accompanied by a summary.

Dr. FREHSE introduced a discussion about issuing the Commission's recommendations for residue analytical procedures as IUPAC Technical Reports (to the *Inf. Bull.*). It was agreed that each author of the working papers should decide whether he will prepare his paper as a progress report or as a manuscript for publication as a Technical Report. When such a manuscript had been adopted by the Commission, and if it was written in the required style and format, it should be issued as a Technical Report via the secretariat. Even after a Technical Report had been issued there would still be a need to follow the progress of the subject matter. The Chairman pointed out that by being issued as Technical Report the recommendations of the Commission would reach broader circles than in the past.

It was further agreed that if the Technical Reports adopted at a Commission meeting were to be published in a single volume, a common introduction would be needed. According to the opinion expressed and adopted in previous Commission meetings no 'standard methods' were to be recommended in the Technical Reports but only guidelines of analytical procedures which were tested and supported by collaborative studies by reliable laboratories and found to be applicable to food, feed and environmental substrates such as

water and soil. Details of the procedures were not to be given if they were readily available in the literature. The view was expressed that alternative procedures of different degrees of sophistication would be required, because availability of equipment and reagents might vary.

It was decided that the manuscripts of Technical Reports to be adopted at this Commission Meeting should be revised as necessary and sent by the end of 1975 to both the Chairman and the Secretary of the Commission.

The minutes of this Meeting would be published in *Comptes Rendus 28th Conference* and in the Journal of the Association of Official Analytical Chemists. However the Appendices to the minutes would be included only in the *Comptes Rendus*.

3. Technical Reviews

(i) *Organochlorine Compounds*. Mr. ELGAR introduced his manuscript of a proposed Technical Report 'Recommended Methods for Residues of Organochlorine Insecticides'. The recommendations covered aldrin, BHC, camphechlor, chlordane, DDT complex, dieldrin, endosulfan, endrin, heptachlor, heptachlor epoxide, lindane and methoxychlor. The principal recommendation was the multiresidue method as described in Vol. 1 of the *Pesticide Analytical Manual* (US Dept. of Health, Education and Welfare, FDA, Washington DC: 1972). Other multiresidue methods might be used, such as those published in Canada (*Analytical Methods for Pesticide Residues in Food*, Canada Dept. of National Health and Welfare, Ottawa: 1973) and those developed by the UK Laboratory of the Government Chemist for analysis of fatty foods [de FAUBERT MAUNDER *et al.*, *Analyst* **89**, 168 (1964); WOOD, *Analyst* **94**, 399 (1969)]. Comparative studies [SMART *et al.*, *J. Assoc. Offic. Anal. Chem.* **57**, 153 (1974)] have shown that there were no gross discrepancies in the results obtained by different methods. The manuscript was adopted with minor revisions to be submitted for publication as a Technical Report.

Dr. FREHSE introduced a letter from Assistant Secretary IUPAC asking for comments on the draft International Standard Technical Committee ISO/TC 34/SC 5 'Milk and Milk Products Determination of the Organochlorine Pesticide Residues Content'. In the discussion, the policy of the Commission not to support publication of standardized methods for residue analysis was reconfirmed. The Chairman was asked to seek by letter formal cooperation with ISO in matters which were within the interests of the Commission.

(ii) *Organophosphorus Compounds*. Dr. FREHSE presented a working paper 'Residue Analysis of Organophosphorus Compounds' by G. TIMME and H. FREHSE (translated and co-edited by J. EDWARDS: Appendix I). The paper constituted both a supplement to the Report presented at the 1974 Commission meeting and a supplementary review of literature to the Report made in 1970. There was a lengthy discussion on the validation of methods in terms of extractability. It was agreed that Dr. FREHSE would prepare a manuscript by combining the recommendations on validated methods reviewed in the working papers in 1974 and 1975 for publication as a Technical Report.

Dr. BÁTORA reported (Appendix II) about the latest developments in methodology in Comecon countries. A number of new publications were referred to.

(iii) *Fumigants*. Mr. HEUSER provided a working paper (Appendix III) in which developments in analytical methods or their evaluation since the 1974 Report were reviewed. In addition he introduced a manuscript 'Recommendations on Analytical Methods for Fumigant Residues' for publication as a Technical Report. The manuscript was accepted with minor revisions.

The recommendations were made in respect of hydrogen cyanide, hydrogen phosphide, bromide ion, total bromine, carbon tetrachloride, chloroform, 1,2-dibromoethane, trichloroethylene, bromoethane, chloropicrin, 1,2-dichloroethane, ethylene oxide, carbon disulphide and acrylonitrile.

Three papers prepared by Dr. MAYR for Commission on Terminal Pesticide Residues on hydrogen phosphide, ethylene oxide and bromomethane were distributed to the Commission for information.

(iv) *Carbamate Insecticides*. A progress report by Dr. ABBOTT and Mr. RUZICKA (Appendix IV) and a comment by Dr. MIYAMOTO (Appendix V) were received and discussed. A proposal for publication as a Technical Report was discussed and it was agreed that Dr. ABBOTT and Dr. MIYAMOTO would be requested to revise jointly the draft for publication.

(v) *Carbamate Fungicides*. Dr. RESNICK reported on progress in the analysis of dithiocarbamate fungicides and ethylene thiourea (Appendix VI). Also Dr. ENGST's paper received by the Commission on Terminal Pesticide Residues was distributed. Since significant basic research on the analysis of these compounds had been done and comparative studies were in progress, it was expected that recommendations could be made in next year's meeting.

(vi) *Carbamate Herbicides*. Dr. RESNICK reported (Appendix VII) that very little had been published lately regarding methodology for residues of this group of pesticides.

(vii) *Fungicides other than Carbamates*. Dr. ABBOTT had prepared recommendations for the determination of binapacryl [BAKER and HOODLESS, *Analyst* 98, 172 (1973)] and of captan, captafol and folpet [BAKER and FLAHERTY, *Analyst* 97, 713 (1972)]. It was agreed that these two drafts would be accepted for publication as Technical Reports and that the recommendation for quintozone would be kept under review by Mr. EDWARDS until next meeting. Dr. BÁTORA made a comment that quintozone might contain tecnazene as an impurity.

(viii) *Organotin Compounds*. Dr. KOIVISTOINEN reported on the analysis of organotin compounds including the pesticides tricyclohexyltin hydroxide and triphenyltin hydroxide, acetate and chloride (Appendix VIII). It was concluded that there was continuous need of an analytical system applicable in pesticide residue laboratories in which various organotin compounds could be separated and specifically determined from the same sample or in a multi-residue analytical system. It would also be desirable to find out in what chemical forms natural tin occurs in biological materials. Analysis of organotin compounds would be kept under review.

(ix) *Rethrins and Synergists*. Dr. HILL introduced his draft for recommended methods for pyrethrins (*Pesticide Analytical Manual*, Vol. 2, Dept. of Health, Education and Welfare, FDA, Washington) and piperonyl butoxide (*Official Methods of Analysis of AOAC*, 12th ed., 1975). The draft was accepted for publication as a Technical Report.

4. General Reviews

The following general reviews of analytical procedures were received: 'Application of Statistical Analysis to Residue Data' by Mr. ELGAR; 'Second Contribution to the Problems of Detection Limits in Residue Analysis' by Dr. GORBACH; 'Confirmatory Tests' by Dr. GREENHALGH; and 'A Convenient Small-scale Clean-up Method for Extracts of Fatty Samples with Basic Alumina before g.l.c. Analysis in Organochlorine Pesticide Residues' by Drs. GREVE and GREVENSTUCK.

A paper on 'Detectors for use in GC Analysis of Pesticides' published in *J. Chromatogr. Sci.* 13, 329 (July 1975) was submitted by Dr. AUE.

Dr. WIDMARK informed the Commission that the May, June and July issues of *J. Chromatogr. Sci.* (1975) contain general reviews of pesticide

residue methodology.

It was agreed that in the 1976 Commission meeting there would be a special half-day session on general topics of residue analysis. The papers mentioned above and others to be received would be discussed in detail in that session. The Chairman pointed out that in the future more emphasis would be placed on general topics such as interpretation, instrumentation and technology.

5. Cooperation with International Organizations

The Commission would seek cooperation with other international organizations and continue its cooperation with the FAO/WHO Joint Meeting on Pesticide Residues and the CCPR. Dr. FREHSE was providing the CCPR with the information it had requested.

6. 1978 Pesticide Chemistry Congress

Dr. GEISSBÜHLER welcomed cooperation for the next Congress. His progress report on the preparations for the Congress was given in the Joint Session of the Section and Commissions.

7. Assignments for 1976 Meeting

It was agreed that members staying in the Commission would carry on their assignments until the 1976 Meeting. Due to changes in the membership, the Chairman would in the near future contact new members and propose assignments that would contribute to the programme of the Commission.

8. Joint Meetings

Short joint meetings were held with the Section on Food and the Section on Oils and Fats. Common problems were briefly discussed. The Commission would keep the Oils and Fats Section informed on its recommendations for organochlorine multiresidue procedures.

9. Membership

The terms of the following members had expired in 1975: Dr. ABBOTT, Dr. KOIVISTOINEN, Dr. SLADE, Dr. AUE and Mr. ELGAR. The terms of the following members are proposed to be extended until 1977: Dr. FREHSE (Chairman), Dr. POLEN, Dr. WIDMARK, Dr. GORBACH, Dr. HEUSER and Dr. RESNICK. The following new Titular Members were proposed until

1979: Mr. M. J. EDWARDS (Secretary until 1977), Dr. P. A. GREVE and Dr. M. KLISENKO. The following new Associate Members were proposed until 1977: Mr. J. A. R. BATES, Dr. G. K. GHEORGHIEV, Mr. I. S. TAYLOR, Dr. H. P. THIER and Dr. S. Lj. VITOROVIĆ.

10. Next Meeting

The next meeting of the Commission would be held in Leverkusen, Federal Republic of Germany, during the third week of September 1976 at the invitation of Bayer AG.

Appendix I: Residue Analysis of Organophosphorus Compounds

This Working Paper constitutes both a supplement to the Report presented in 1974 (13) and a supplementary literature review to the Report submitted to the Commission in 1970 (12). The principles applied in selecting the cited methods were outlined in last year's Report (13); however, the present Report additionally takes account of such confirmatory methods, clean-up procedures, methods of separation and methods of determination which can each be used for many compounds. The idea put forward in 1969 (11) of 'combining' such 'partial methods' to form complete multimethods whenever the need arises, is thus further pursued.

Only a few of the complete multimethods described in the present Report can be recommended for general use. A condition for such a recommendation is that a procedure has been validated in laboratories outside its author's premises, and that adequate recoveries could be demonstrated (13). When we categorize a method as 'not validated' in the above context, this need not necessarily mean that the method in question is rated negatively but may simply indicate that we are unaware of it perhaps already having been validated. We are always grateful for notification of validations.

The term *multiresidue methods* is usually understood to mean those methods with which a large number of *residues* can be determined or at least detected. The number of *substrates* to which such a method can be applied often recedes into the background particularly when the substrates involved attach a special importance peculiar only to themselves (e.g. cereals, soil, water, etc.). Although the 'ideal' multimethod would be a combined multiresidue/multisubstrate method, it seems premature to consider multimethods acceptable solely from such wide-ranging aspects.

Not all widely used organophosphates are already covered by multimethods; hence, *special methods* are still needed for a number of them (13).

Table 1. Complete multiresidue methods for organophosphates. The figures in the headings indicate the references. x = analyzable

Pesticide	Validated Methods				Comments	Other Methods										Confirmatory Methods		
	3a	3b	3c	30		6	14	20	25	26	27	35	3d	7	33			
Azinphos-ethyl				x	see also (13)	x			x									
Azinphos-methyl				x	see also (13)		x		x									
Bromophos-ethyl					see (13)													
Bromophos-methyl					see (13)													
Carbophenothion					see also (13)													
Chlorfenvinphos					see (13)			x		x								
Chlorpyrifos					special method, see (13)													
Coumaphos					special method, see chap. III and (13)													
Cruformate					special method, see (13)													
Cyanofenphos				x	no method available									x				
Demeton					see (13)				x ²									
Demeton-methyl & Oxydemeton-methyl					see (13)													
Diazinon	x		x	x	see also (13)		x	x	x	x		x		x ¹				
Dichlorvos					see (13)													
Dimethoate					see (13)				x									
Dioxathion					see (13)													
Disulfoton				x ²	see also (13)	x ²			x ²									
Ethion				x	see also (13)	x												
Fenamiphos	x		x	x	special method, see (13)													
Fenchlorphos				x	see also (13)	x	x	x	x	x	x	x	x	x ¹				

Fenitrothion		see (13)	x	x ²	x	x ¹	x ¹
Fensulfothion		special method, see (13)					
Fenthion		see (13)		x ²			
Formothion		see (13)					
Leptophos		special method, see Chap. III					
Malathion	x	see also (13)	x	x	x	x	x ¹
Methodathion		special method, see (13)					
Mevinphos		see (13)					
Monocrotophos		special method, see (13)					
Omethoate		see (13)					
Oxydemeton-methyl		see demeton-methyl					
Parathion	x	see also (13)	x ¹	x	x	x	x ¹
Parathion-methyl	x	see also (13)	x	x	x	x	x ¹
Phosalone		see (13)					
Phosphamidon		see (13)					
Pirimiphos-methyl		special method, see Chap. III			x		
Thiometon		see (13)					
Trichlorfon		see (13)					
Trichloronat		special method, see (13)					
Vamidothion		special method, see (13)					

¹ = oxon included ² = significant oxidative metabolites *not* included.
Methods 3a, 3c and 3d are identical with methods A, B and C in the report of the last year (13).

Table 1a. Additional compounds covered by some of these methods

Pesticide	Validated Methods				Comments	Other Methods										Confirmatory Methods		
	3a	3b	3c	30		6	14	20	25	26	27	35	3d	7	33			
Carbophenothion-methyl				x			x											
Dichlofenthion					see (13)													
Dimefox					see (13)													
EPN		x			see (13)													
Ethoate-methyl																		
Fonofos						x		x										
Iodofenphos					see (13)													
Mecarbam					see (13)													
Naled (dibrom)					see (13)													
Phenkapton					see (13)													
Phorate				x ²	see also (13)	x ²			x ²									
Phosmet				x														
Pyrimithate					see (13)													
Sulfotep					see (13)													
Zinophos					see (13)													
(thionazin)																		

² = significant oxidative metabolites *not* included

Methods 3a, 3c and 3d are identical with methods A, B and C in the report of the last year (13).

Therefore, special methods will be cited for a compound only if the respective compound is not covered by a multimethod either in this present Report or in a previous one; in such instances, new special methods only will be described. In Section III, consideration is given only to those thirty-nine organophosphates which are or were of interest for the purposes of JMPR and CCPR up to and including 1975 (see 13). Of these compounds, cyanofenphos (JMPR 1975) is the only one for which there is no method in the literature.

Table 1 provides a survey of the complete multiresidue methods so far published for the thirty-nine organophosphates. This table lists all studies on multimethods (validated methods, other methods, confirmatory methods) considered in the present Report, together with references to earlier cited (13) validated multimethods and to special methods. Reference to special methods here do not necessarily imply classification as a validated method (see 13).

Table 2 lists the substrates which insofar as evident from the publications, can be analyzed with these methods. This table also contains references to last year's Report (13).

I. Multiresidue Methods Considered as Validated

(1) *General Method for Chlorinated and Phosphated Pesticides.* The method (3a*) was revised editorially (1) as compared with the 11th edition of 1970. The determination of diazinon, fenclorophos, ethion, malathion, parathion and methyl parathion was adopted official final action (3a). Official first action status was repealed for the determination of carbophenothion (2). Table 2 lists all nonfatty foods in accordance with the changes in (1).

(2) *Multiple Residue Method for Phosphated Pesticides.* The sweep codistillation method (3c) was adopted official final action.

A carbon column cleanup multiple residue method (3b) was adopted official first action for parathion, paraoxon, carbophenothion and its oxygen analog, and EPN in apples and green beans. The method is based on a procedure of STORHERR *et al.* (37) and was confirmed by a collaborative study conducted by LASKI (23). Following statistical analysis of the results, flame photometric detection was given preference over the thermionic detection system at first recommended (2, 8).

(3) *Single Sweep Oscillographic Polarographic Confirmatory Method (for 3a).* The method (3d) was adopted official final action.

* Method numbers refer to references.

Infant food (milk basis)				
Kale	x	x		x
Leek				
Lettuce	x	see also (13)	x	x
Meat				
Milk				x
Milk powder				x
Oats	x			
Oils (vegetable)				
Onions	x		x	
Peaches	x	see also (13)	x	x
Pears	x	see also (13)	x	
Peas	x		x	
Peppers	x			
Plums	x	see also (13)		
Popcorn	x			
Potatoes	x		x	
Pumpkin			x	
Radishes				
(incl. tops)	x			
Salads (green)			x	
Spinach	x			
Squash	x			
Strawberries	x			
Sugar beets	x	see also (13)	x	x
Sweet potatoes	x			
Tobacco				x
Tomatoes	x		x	
Turnips	x			
Water			x	
Wheat	x			x
'Various greens' (of minor importance)	x	see also (13)		

Methods 3a and 3c are identical with methods A and B in the report of the last year (13).

(4) A method for the determination of fourteen organophosphorus pesticides in natural waters was developed by RIPLEY *et al.* (30). Two extraction procedures with recoveries of 95–110% for all compounds except crufomate (115%) and two concentration procedures with recoveries of 95–116% are described. Compounds are determined by isothermal gas chromatography using a flame photometric detector that is quantitatively sensitive to phosphorus. The sensitivity of the method for most of the fourteen compounds is 0.01 ppb. The study of Ripley *et al.* did not deal with metabolites.

II. Other Multiresidue Methods

(1) *Complete Methods.* A method developed by STIJVE and CARDINALE (35) for the determination of chlorinated pesticides, polychlorinated biphenyls and phosphated insecticides in fatty foods is under consideration for publication in the *Manual of Pesticide Residue Analysis Methods* issued by the Deutsche Forschungsgemeinschaft.

After cleanup of the extracts on a Florisil column, the residues are determined by gas chromatography. Non-polar phosphated pesticides can be detected down to 0.05 ppm provided that the sample extract used for gas chromatography represents not less than 1 g of fat per ml. Confirmatory analysis is carried out by thin-layer chromatography (silica gel; esterase inhibition procedure). The authors state that the method has the advantage of being easy and fast as well as reliable. The publication however, includes no data on the recovery of the OP compounds.

OSADCHUK *et al.* (27) describe a method for the identification and determination of thirty-nine pesticides, including eleven organophosphorus compounds. Separation of the residues into nine fractions using a partially deactivated Florisil column — whereby pesticides having mutually interfering responses are separated into different fractions — is followed by either gas-chromatographic determination (ECD or phosphorus-specific detector) or thin-layer chromatographic determination (MN-Kieselgel G-HR). The recoveries of the OP compounds from fruit and vegetables (apples, celery, carrots) range from 85 to 98% and the recoveries from butterfat range from 89 to 100%.

The authors describe the method as being very flexible and versatile so that it is suitable for use in monitoring and regulatory laboratories.

LEVI and NOWICKI (25) modified a previously reported method for screening of organochlorine residues in wheat (24) to permit rapid simultaneous screening of organophosphate residues. In this method, ground wheat

is extracted by ball-milling with ethyl ether-hexane (3 + 97). The extract is divided into two equal portions. One-half is used without cleanup for determination of organophosphates by flame photometric detection. The other half is cleaned up on Florisil prior to determination of organochlorines by electron capture detection. Wheat analyzed immediately after treatment with fifteen organophosphates showed a mean recovery of 93%.

An older rapid screening method reported by CAMONI *et al.* (6) likewise permits simultaneous screening of organochlorine and organophosphorus compounds in fruit and vegetables. After extraction and column chromatography, the extract is analyzed by gas chromatography using an ECD and a thermionic detector. The limit of detection is reported to be approximately 0.05 ppm. The authors state that the method is satisfactory, and point out that it is capable of being extended with respect to both pesticides and crop commodities. Furthermore, the extract can be used for qualitatively confirming the gas-chromatographic results by means of thin-layer chromatography. Owing to certain difficulties in obtaining and standardizing some of the reagents needed, the method was gradually abandoned in recent years.

FREI and MALLET (14) report a method for the quantitative analysis of organothiophosphorus pesticides by *in situ* fluorimetry after separation on silica-gel N layers, which they consider offers a reasonable alternative to g.l.c. The utility of the method was tested by analyzing tap water spiked with azinphos-methyl and parathion. The recoveries ranged from 80% at 0.5 ppb to 92% at 100 ppb. The results were found to agree well with gas-chromatographic data.

The determination of organophosphorus pesticides in tobacco is rendered possible by the method reported by NESEMANN and SEEHOFER (26). After several purification steps, the residues are determined by gas chromatography using a flame photometric detector.

Two Japanese methods will be discussed only briefly because these publications could be appraised only from the English summaries.

IWAIDA *et al.* (20) determined six organophosphorus compounds in sulphur-containing vegetable samples, after cleanup on Florisil and thin-layer chromatography with an FPD. The recoveries ranged from 100 to 107%. The detection limit of this method was quite high being 0.5 ppm. INOUE *et al.* (19) extracted nine organophosphorus pesticides from vegetables by a method which gave recoveries ranging from 54.5% for disulfoton to 96.3% for parathion.

A multiresidue method for determining residues of organophosphorus

compounds, organochlorine compounds and carbamates in *air* is described by SHERMA and SHAFIK (32). Seven phosphate compounds were determined by flame photometric gas chromatography. The authors state it is expected that the method will be applicable to other compounds, and that it may be adaptable for the analysis of pesticide residues in foods and other environmental samples.

(2) *Confirmatory Methods*. SINGH and LAPOINTE (33) describe a procedure by which six organothiophosphorus pesticides can be confirmed when present individually or in combination. The compounds are oxidized by neutralized sodium hypochlorite solution and the oxidation products are characterized by gas chromatography, using a flame-photometric detector. The authors state that the method has the advantage of being rapid and simple, relatively specific and highly sensitive.

A second confirmatory method for OP compounds is described by COBURN and CHAU (7). After extraction and quantitation by flame-photometric detector gas-liquid chromatography, five organophosphorus pesticides are hydrolyzed in a 10% methanolic-potassium hydroxide solution, followed by derivatization with pentafluorobenzyl bromide to produce the pentafluorobenzyl (PFB) ethers of the phenolic hydrolysis products. The PFB ethers are subsequently fractionated on a silica gel microcolumn, and analyzed by electron capture g.l.c. Separate confirmation of parathion and methyl parathion is not possible, since both are hydrolyzed to *p*-nitrophenol.

(3) *Methods of Separation or Determination (without extraction procedure)*. REICHLING and EGGER (29) developed a method for the chromatography of nine organophosphorus insecticides on thin layers of basic zinc carbonate. Best results are obtained by using mixtures of petroleum ether and acetone as solvent. Visualization is effected with fluorescence indicator of Pd(II)Cl_2 solution. The effects of separation are similar to those obtained on silica gel. Demeton-*S*-methyl and azinphos-methyl, however, show corresponding R_f values. But the authors state that basic zinc carbonate has the advantage of low chemical activity so that only few artefacts are formed. SEIBER (31) used reversed-phase liquid chromatography for the separation of seventeen pesticides including methyl parathion, azinphosmethyl, malathion, ethyl parathion and diazinon (column packing: Vydac reversed-phase in water-methanol and water-ethanol mixed solvents). The OP compounds were detected with a 254-nm ultraviolet detector.

A g.l.c. system for the separation of ninety-five organonitrogen pesticides (22) can be applied with some reservation to the OP compounds omethoate,

dicrotophos, monocrotophos, dimethoate, diazinon and phosphamidon, using a nitrogen-specific electrolytic conductivity detector. EPA and FDA jointly chromatographed most of the compounds, and the agreement was very good. The authors claim that the extraction and cleanup procedure developed by STORHERR *et al.* (37) can be successfully used in studies for determining residues of nitrogen-containing OP pesticides by their method.

SUZUKI *et al.* (39) describe a systematic identification and determination of a large number of pesticides by a combination of column, thin-layer and gas chromatography. The pesticides are firstly classified into six divisions by t.l.c. The OP pesticides are in the second and third divisions. Determination is by gas chromatography using an ECD, FID or thermionic detector. The recoveries are stated to be more than 90% for most of the pesticides. The method seems to be quite complex since it is not specifically directed towards the analysis of OP compounds but is supposed to cover more than 100 pesticides. SUZUKI states in a personal communication (40) that this method is being successfully used in his laboratory for foods, soil and water; however, the publication (39) does not contain any methodical details thereon.

A nonspecific spectrophotometric method for the determination of organophosphorus pesticides is described by TURNER (42). It involves the reaction of 4-(4-nitrobenzyl) pyridine with the pesticide in an acetone—water—ethanol mixture at 100°C to produce the dye precursor. The colour is produced after the addition of tetraethylenepentamine.

(4) *Cleanup methods.* SILVA-FERNANDES *et al.* (10) describe a cleanup procedure for gas-chromatographic (thermionic detector) or thin-layer chromatographic (t.l.c.) determination of organothiophosphates in fruit and vegetables. In this procedure, cleanup is performed in a chromatographic column packed with Florisil and a mixture of activated carbon and attapulpus clay. According to the authors, extraction and cleanup are rapid and efficient by this procedure. The recoveries obtained by subsequent g.l.c. or t.l.c. range from 90 to 109% at 0.1 ppm and from 80 to 103% at 0.01 ppm.

A cleanup of organophosphorus pesticide residues in vegetable extracts by gel chromatography on Sephadex LH-20 was performed by PFLUGMACHER and EBING (28). Twenty-two organophosphorus pesticides were extracted from twelve different vegetable extracts with acetone and cleaned up. Recoveries ranging from 66 to 98% at residue levels of 0.05–0.5 ppm were obtained by gas chromatography using a thermionic detector. Compared with conventional cleanup procedures (silica gel, Florisil, aluminium oxide), an advantage

of this gel permeation method for routine work is that the same column can always be used for many analyses. The method is also especially suitable for use in those cases where extracts must be cleaned up with a maximum of care. The authors state that the use of this cleanup procedure can be extended to nearly all phosphorus pesticide residues in food crops.

KOVÁČ *et al.* (21) modified the sweep co-distillation method of STORHERR and WATTS (36) for the cleanup of organophosphorus pesticide residues in extracts of crops and milk. A simple gas chromatograph was adapted to the sweep co-distillation cleanup. Extracts of gourds, kale, carrots, sugar-beet tops, cauliflower, tomatoes, lettuce, apples, plums and pears and of milk were analyzed for diazinon, fenitrothion, malathion and trichloronat by gas chromatography using a thermionic detector. The recoveries ranged from 62 to 108%.

GRIFFITT and CRAUN (15) evaluated the automated gel permeation chromatographic (g.p.c.) system developed by STALLING *et al.* (34); Bio Beads S-X2 were utilized as gel material. Thirty pesticides including eight organophosphorus compounds (carbophenothion, diazinon, ethion, fenchlorphos, malathion, parathion, methyl parathion, phorate) were concentrated from milk fat and determined by gas chromatography. The recoveries of the eight organophosphorus compounds (without subsequent Florisil cleanup) ranged from 79 to 110% with the exception of methyl parathion which eluted outside the usual pesticide fraction. Compared with a Florisil cleanup, better recoveries can be obtained with this g.p.c. system which is also stated to provide substantial time savings.

A cleanup procedure for the determination of fenitrothion, malathion, parathion and their oxons in animal tissues (blood, muscle, liver) was developed by HLADKÁ and KOVÁČ (16). The extraction of the ^{14}C - and ^{32}P -labelled insecticides from a homogenate column consisting of silica gel and animal tissue also partly comprises cleanup of the extracts because the polar compounds remain on the column. The recoveries determined by measurements of radioactivity ranged from 79 to 98%, equivalent to an average of 90.5% with a relative standard deviation of $\pm 5.1\%$. The authors state that the cleanup method is sufficient for gas-chromatographic determination of the pesticides and for semi-quantitative thin-layer chromatographic determination of their oxons.

III. Special Methods

No more new special methods were published for the following organophosphorus compounds:

Demeton-S-methyl (incl. oxydemeton-methyl)
Fenamiphos
Fensulfothion*
Methidathion
Monocrotophos
Trichloronat
Vamidothion*

Coumaphos. Coumaphos and its oxon (coroxon) were determined by ZAKREVSKY and MALLET (43) in eggs by means of *in situ* fluorometry. In this method, extraction, liquid-liquid partition and Florisil cleanup are performed as described by Thornton (41). After thin-layer chromatography using plates coated with silica gel H, the fluorescence is measured directly on the chromatogram.

This *in situ* fluorometric method is proposed as an alternative to the g.l.c. method described by THORNTON (41) [see also (13)]. Apart from its simplicity, the method does not, however, offer any advantages over the gas-chromatographic method although it might be of value as a confirmatory method.

Leptophos. BOWMAN and BEROZA (4) devised a method for determining residues of leptophos, its oxygen analog and its phenolic hydrolysis product in corn (maize) and milk. The compounds are separated by liquid chromatography of the extract on two columns (silica gel and alumina), prior to gas chromatographic analysis, using a flame-photometric detector for the parent compound and the oxygen analog and an electron-capture detector for the phenol.

A gas-chromatographic method for residue analysis of leptophos, its oxygen analog and its phenol in field-treated wheat plants has been published by STRUBLE and McDONALD (38). Three cleanup procedures are described and evaluated. In this method, too, gas-chromatographic analysis is performed using a flame-photometric detector for the parent compound and the oxygen analog and an electron-capture detector for the phenol.

In the method described by CURRIE (9) for determination of leptophos residues in rapeseed grains, the parent compound and its phenolic metabolite are determined by gas chromatography using a flame-photometric detector, and the oxon is determined by using thin-layer chromatography and enzyme inhibition detection.

* For a summarized presentation of the methods cited in last year's Report (13), see (44).

Good recoveries are given for each of the three methods of leptophos residue analysis. A further method (5) for the determination of leptophos and its oxon in plant tissues (lettuce and celery) was already cited in last year's Report (13) since it permits simultaneous determination of chlorpyrifos.

Pirimiphos-methyl. Two ICI methods will be published shortly (45), by means of which pirimiphos-methyl and its phosphorus-containing metabolites can be determined in crops (root crops, fruit, vegetables, stored grain, bread, bran and fine offal, oily or fatty crop samples), water, milk and animal tissue (17), and in soil (18). Gas-chromatographic determination is performed using either a flame-photometric detector or a thermionic detector. In method (17) use is made of a glass column packed with 3% (w/w) phenyldiethanolamine succinate on Chromosorb W-HP (80–100 mesh); for the soil analysis method (18), use is made of the same stationary phase but coated on Gaschrom Q (100–120 mesh). In addition, alternative and confirmatory column packings are described. The limit of detection is at 0.01 ppm.

'While the residue method (17) has been developed for pirimiphos-methyl and its two potential organophosphorus-containing metabolites, a very large number of residue analyses on a wide variety of samples has indicated that significant residues of the metabolites are rarely found. For many samples therefore the residue method is simplified to being determination of pirimiphos-methyl only.'

Both methods seem suitable for regulatory purposes.

References

1. *J. Assoc. Offic. Anal. Chem.* **57** (2), 491 (1974).
2. *J. Assoc. Offic. Anal. Chem.* **58** (2), 397 (1975).
3. AOAC, *Official Methods of Analysis*, 12th edn. (1975). (a) 29.001–29.028. (b) 29.033–29.037. (c) 29.038–29.043. (d) 29.044–29.048.
4. M. C. BOWMAN and M. BEROZA, *J. Agric. Food Chem.* **17** (5), 1054–1058 (1969).
5. H. E. BRAUN, *J. Assoc. Offic. Anal. Chem.* **57** (1), 182–188 (1974).
6. I. CAMONI, N. GANDOLFO, G. RAMELLI, A. SAMPAOLO, and L. BINETTI, *Boll. Lab. Chim. Provinciali (Bologna)* **18** (5), 579–612 (1967).
7. J. A. COBURN and A. S. Y. CHAU, *J. Assoc. Offic. Anal. Chem.* **57** (6), 1272–1278 (1974).

8. P. E. CORNELIUSSEN, *J. Assoc. Offic. Anal. Chem.* **58** (2), 238 (1975).
9. R. A. CURRIE, *J. Assoc. Offic. Anal. Chem.* **57** (5), 1056–1060 (1974).
10. A. M. S. SILVA FERNANDES, T. REIS, S. M. CONTE DE BARROS, *Rev. Agron.* **50** (4), 1–9 (1967).
11. H. FREHSE, *Pflanzenschutz-Nachr.* **23**, 204–216 (1970).
12. H. FREHSE, *Pflanzenschutz-Nachr.* **24**, 269–282 (1971).
13. H. FREHSE, *IUPAC Inf. Bull.*, in the press
14. R. W. FREI and V. MALLET, *Int. J. Environ. Anal. Chem.* **1** (2), 99–111 (1971).
15. K. R. GRIFFITT and J. C. CRAUN, *J. Assoc. Offic. Anal. Chem.* **57** (1), 168–172 (1974).
16. A. HLADKÁ and J. KOVÁČ, *Z. Anal. Chem.* **265**, 339–341 (1973).
17. ICI (England), *Residue Analytical Method*, No. 11a.
18. ICI (England), *Residue Analytical Method*, No. 12.
19. Y. INOUE, K. FUKUHARA and M. TAKEDA, *Shokuhin Eiseigaku Zasshi (J. Food. Hyg. Soc. Japan)* **15** (5), 337–341 (1974) (ref.: *Pesticides Abstracts* No. 500, 1975).
20. M. IWADA, Y. KANEDA and A. YAMAJI, *Yakugaku Zasshi (J. Pharm. Soc. Japan)* **94** (9), 1178–1180 (1974) (ref.: *Pesticides Abstracts* No. 747, 1975).
21. J. KOVÁČ, V. BÁTORA, A. HANKOVÁ and A. SZOKOLAY, *Bull. Environ. Contam. Toxicol.* **13** (6), 692–697 (1975).
22. R. R. LASKI and R. R. WATTS, *J. Assoc. Offic. Anal. Chem.* **56** (2), 328–332 (1973).
23. R. R. LASKI, *J. Assoc. Offic. Anal. Chem.* **57** (4), 930–933 (1974).
24. J. LEVI, P. B. MAZUR, T. W. NOWICKI, *J. Assoc. Offic. Anal. Chem.* **55** (4), 794–799 (1972).
25. J. LEVI and T. W. NOWICKI, *J. Assoc. Offic. Anal. Chem.* **57** (4), 924–929 (1974).
26. E. NESEMANN and F. SEEHOFER, *Beitr. Tabakforsch.* **7** (5), 251–262 (1974).
27. M. OSADCHUK, M. ROMACH and K. A. McCULLY, *Proceedings of the Second International IUPAC Congress of Pesticide Chemistry*, Vol. 4, *Methods in Residue Analysis*, 357–383 (1971).
28. J. PFLUGMACHER and W. EBING, *J. Chromatogr.* **93** (2), 457–463 (1974).
29. J. REICHLING and K. EGGER, *Z. Anal. Chem.* **268**, 124–126 (1974).
30. B. D. RIPLEY, R. J. WILKINSON and A. S. Y. CHAU, *J. Assoc. Offic. Anal. Chem.* **57** (5), 1033–1042 (1974).

31. J. N. SEIBER, *J. Chromatogr.* **94**, 151–157 (1974).
32. J. SHERMA and T. M. SHAFIK, *Arch. Environ. Contam. Toxicol.* **3** (1), 55–71 (1975).
33. J. SINGH and M. R. LAPOINTE, *J. Assoc. Offic. Anal. Chem.* **57** (6), 1285–1287 (1974).
34. D. L. STALLING, R. C. TINDLE and J. L. JOHNSON, *J. Assoc. Offic. Anal. Chem.* **55** (1), 32–38 (1972).
35. T. STIJVE and E. CARDINALE, *Mitt. Geb. Lebensmittelunters. Hyg.* **65** (1), 131–150 (1974).
36. R. W. STORHERR and R. R. WATTS, *J. Assoc. Offic. Anal. Chem.* **48** (6), 1154–1158 (1965).
37. R. W. STORHERR, P. OTT and R. R. WATTS, *J. Assoc. Offic. Anal. Chem.* **54** (3), 513–516 (1971).
38. D. L. STRUBLE and S. McDONALD, *J. Econ. Entomol.* **66** (6), 1321–1325 (1973).
39. K. SUZUKI, H. NAGAYOSHI and T. KASHIWA, *Agric. Biol. Chem. (Tokyo)* **38** (8), 1433–1442 (1974).
40. K. SUZUKI, personal communication, 7 July 1975.
41. J. S. THORNTON, Chemagro Corp. Research Department, Kansas City, MO Report No. 22 051.
42. C. R. TURNER, *Analyst (London)* **99**, 431–434 (1974).
43. J. -G. ZAKREVSKY and V. N. MALLETT, *J. Assoc. Offic. Anal. Chem.* **58** (3), 554–556 (1975).
44. G. ZWEIG, *Analytical Methods for Pesticides and Plant Growth Regulators*, Vol. VII (Academic Press, New York & London: 1973), Chap. 10 (Fensulfothion), Chap. 28 (Vamidothion).
45. G. ZWEIG, *Analytical Methods for Pesticides and Plant Growth Regulators*, Vol. VIII, in the press.

Appendix II: Residue Analysis of Organophosphorus Compounds Reported in Comecon Countries

Thin-layer Chromatographic Methods

Methods had been published for formothion and dimethoate in different organs of animals (1), mixture of formothion, dimethoate, trichlorfon and dichlorvos in mixed feeds (2), and also for detection of tetrachlorvinphos and its metabolites in plants (3).

A method involving polarographic determination of sulphur containing compounds had been used by KAVETSKII (4) for determining and examining

the transformation of diazinon, dichlorvos, dimethoate and phenkapton in plant tissue. Residues of dimethoate, diazinon and phenkapton were treated with hydrochloric acid, and the liberated H_2S was determined using polarography; the lower limit of detection was 0.00025 mg S/ml.

A method had been reported (5) for determining dimethoate and trichlorfon in molasses and beet cuttings using a Florisil or Magnesil column cleanup for extracts. Phosalone residues present in mixed feeds (6), different varieties of treated apples, peaches, tangerines and currants (7) and also in honey (8) were examined using a t.l.c. method with the limits of detection 0.02–0.3 mg/kg. Malathion residues had been determined in raw fruits (9). After extraction, the waxy materials were removed by adding acetone and water to the evaporated extract and storing at low temperature. Pigments were removed by the same procedure except that methanol and ammonium chloride were used. A method had been proposed for selective detection of trichlorometaphos-3 in forensic samples (10). Eighteen OP pesticides and sulphur- or phosphorus-containing drugs did not interfere, but ronnel interfered with the identification.

Gas Chromatography Methods

Organophosphorus pesticides had been determined in butter during manufacture and storage (11), and in foods of vegetable origin (12). Methods had been published for analysing trichlorfon (13) and dichlorvos (14) in milk. The evaluation of trichlorfon was based on the determination of chloral and dimethyl phosphite, both formed by pyrolysis at 270°C.

Method had been recommended for malathion determination in grapes, grape juice and stewed plums (15). Prior to extraction the raw material is mixed with alcohol and extracted with *n*-hexane, and the extract acidified with conc. hydrochloric acid prior to clean-up on silica gel column.

Chlorfenvinphos (16) and tetrachlorvinphos (17) residues had been determined in samples taken from skin, plants or air, and fruits, respectively. Etephon residues present in winter rye had been determined after extraction with methanol and esterification with diazomethane (18). The use of g.l.c. method had been reported for detecting parathion methyl in hexane extracts from blood (19), and OP pesticides in animal tissues (19a).

Enzymatic Methods

A new enzyme inhibition technique for toxicological study of anticholinesterases had been developed (20). The amount of 2, 4, 5-trichlorophenyl

acetate (substrate) and/or 2, 4, 5-trichlorophenol had been determined by g.l.c. method using EC detection. The Hestrin method had been adapted to routine blood analysis (21).

The procedures for column extraction of OP pesticides and purification of extracts using sweep co-distillation adapted to gas chromatography as reported at the last meeting had been published (22, 23).

References

1. A. F. KONYUKHOV, *Veterinariya (Moscow)* **1**, 96 (1974).
2. A. F. KONYUKHOV, *Veterinariya (Moscow)*, **6**, 101 (1974).
3. G. F. VYLEGZHANINA and L. S. KEISER, *Zh. Anal. Khim.* **30** (3) 590 (1975).
4. V. N. KAVETSKII, *Zashch. Rast. (Kiev)* **19**, 101 (1974).
5. A. Z. USMENCEVA, M. A. PIONTKOVSKAYA, M. A. KLISENKO and M. G. TRETYAK, *Khim. Sel'. Khoz.* **13** (6), 62 (1975).
6. A. F. KONYUKHOV, *Veterinariya (Moscow)* **1**, 84 (1975).
7. N. N. MANKO, M. V. PISMENNAYA and S. L. AKORONKO, *Vopr. Pitan.* **5**, 62 (1974).
8. V. V. LESHCHEV, A. M. SMIRNOV and G. A. TALANOV, *Veterinariya (Moscow)* **6**, 106 (1974).
9. E. I. SOLOV'EVA, A. I. LYUBIVAYA, N. N. KABANOVA and N. N. STASISHINA, *Konservn. Ovoshchesush. Prom-st.* **11**, 38 (1974).
10. N. A. GORBACHEVA, *Farmatsiya (Moscow)* **23**, (6), (1974).
11. V. GAJDUSHKOVA, *Milchwiss.* **29** (5), 278 (1974).
12. D. B. GIRENKO and M. A. KLISENKO, *Vopr. Pitan.* **2**, 79 (1975).
13. K. KOSMALA and B. KOWALSKI, *Bromatol. Chem. Toksykol.* **8** (1) 41 (1975).
14. F. R. MEL'TSER and K. F. NOVIKOVA, *Khim. Sel'. Khoz.* **12** (10) 788 (1974).
15. O. A. TIMOFAEVA and G. A. SHVARTSMAN, USSR Pat. No. 450, 102 (15.11.1974); from *Otkrytiya, Izobret., Prom. Obraztzy, Tovarnye Znaki* **51** (42), 84 (1974).
16. B. SZUCKI, H. MAKSYMIUK and T. NAZIMEK, *Bromatol. Chem. Toksykol.* **7** (1), 43 (1974).
17. G. F. VYLEGZHANINA and L. S. KEISER, *Khim. Sel'. Khoz.* **12**, 592 (1974).
18. H. BEITZ, U. BARASIAK, U. BERGNER and W. CZYRNIA, *Nachrichtenbl. Pflanzenschutz DDR* **28** (12), 252 (1974).

19. M. D. SHVAIKOVA, G. V. GOLOVKIN, B. N. IZOTOV and T. I. ALOSHINA, *Gig. Sanit.* **2**, 78 (1975).
- 19a. A. HLADKA, J. KOVAC and V. KRAMPL, *Z. Anal. Chem.* **274**, 371 (1975).
20. J. KOVAC, V. MARKOVA and P. KRALIK, *J. Chromatogr.* **100**, 171 (1974).
21. E. K. BALASHOVA, D. L. PEVZNER, V. I. ROZENGART and O. E. SHERSTOBITOV, *Lab. Delo* **12**, 719 (1974).
22. J. KOVACICOVA, J. KOVAC and V. BATORA, *Environ. Qual. Safety* **86** (1975).
23. J. KOVAC, V. BATORA, A. HANKOVA and A. SZOKOLAY, *Bull. Environ. Contam. Toxicol.* **13** (6), 692 (1975).

Appendix III: 1975 Report on Residue Analysis of Fumigants

A second draft containing current recommendations on analytical methods for fumigant residues has been prepared and circulated to members of the Commission on Pesticide Residue Analysis. Developments in analytical methods or their evaluation since the 1974 Report are reported below.

Determination of Bromide Ion

Collaborative tests among eight UK and Netherlands laboratories of the g.l.c. method of HEUSER and SCUDAMORE (1) for bromide ion in cereal grains have been completed and an account prepared for publication (2). In these tests bromide ion added as potassium bromide or derived from methyl bromide fumigation was determined as 2-bromoethanol, while bromine present in residual 1, 2-dibromoethane remained intact.

Determination of Total Bromine

STAERK and SUESS (3) compared results of determinations of total residual bromine compounds in vegetables by neutron-activation analysis or by aqueous extraction followed by spectrometric analysis; they reported fairly good correlation of results between the two methods but figures from neutron-activation analysis were consistently slightly higher.

Residues of Halogenated Hydrocarbon Fumigants.

(i) *Bromomethane (methyl bromide)*. ASAKA and SEGUCHI (4) determined free bromomethane in various crops by recovery of the vapour with sweep

codistillation or acid-reflux procedures followed by g.l.c. of methylated thio-phosphorus or sulphur derivatives to give signals from flame-thermionic or electron-capture detectors respectively. A maximum sensitivity of 0.05 ng was claimed but MALONE (5) earlier obtained only low recoveries of bromomethane by these distillation methods.

(ii) *1, 2-Dibromoethane (ethylene dibromide)*. Two variations on the steam distillation/solvent collection methods of KENNETT and HUELIN (6) and BIELORAI and ALUMOT (7) have been reported. DUMAS and BOND (8) determined 1, 2-dibromoethane in the benzene solution of a distillate from apples by g.l.c. using a tritium foil E C Detector and alternative columns for confirmation, consisting of (a) 5% dodecyl phthalate on Chromosorb W 60–80 mesh at 85°; (b) 15% Ucon oil on Chromosorb NAW 60–80 mesh at 120°. A sensitivity of 0.01 mg/kg was claimed. Using similar distillation equipment, but with toluene as trapping solvent, HARGREAVES, WAINWRIGHT and HAMILTON (9) determined 1,2-dibromoethane in vegetables by X-ray fluorescence on the bromine signal, using a lithium fluoride analysing crystal and Philips PW 1410 spectrometer.

(ii) *Multiple residues of halogenated hydrocarbons*. Results of collaborative tests of the multi-residue detection method of HEUSER and SCUDAMORE (10) using residues of carbon tetrachloride, chloroform, 1, 2-dibromoethane and trichloroethylene in fumigated grains as test compounds have been published (11).

BERCK (12) determined 1,2-dibromoethane and carbon tetrachloride residues in fumigated grains by extraction with acetone for 10 days at -18° followed by g.l.c. using a tritium foil E C detector and 3.2 m column of Porapak Q-S 80–100 mesh at 160°, with a claimed sensitivity of 0.05 ng. No 1,2-dichloroethane also believed present, was detected, due probably to lack of sensitivity of the detector to this compound.

Residues from Other Fumigants

Ethylene oxide. PFEILSTICKER, FABRICIUS and SCHULTE (13) showed that, if used in the presence of free ethylene oxide or ethylene glycol, the unmodified multi-detection method of HEUSER and SCUDAMORE (10) involving drying of acetone–water extracts with sodium chloride and calcium chloride not surprisingly gave as reaction products ethylene chlorohydrin and a ketal. The latter authors, however, had already shown the need to use halogen-free drying agents if any, when determining ethylene oxide, ethylene glycol and ethylene chlorohydrin residues (14) and have communicated with

PFEILSTICKER and his collaborators.

Dichlorvos. HOODLESS *et al.* (15) used ^{32}P -labelled dichlorvos to determine the effectiveness of the 'CAM' method for determination of residues in cereal grains (16). They found that methanol extraction removed free dichlorvos but part only of the phosphorus-containing breakdown products which formed rapidly when samples for analysis were stored at 25° . Sample storage at -17° reduced this breakdown very considerably and storage for a minimal period, at this temperature, was recommended.

References

1. S. G. HEUSER and K. A. SCUDAMORE, *Pesticide Sci.* **1**, 244 (1970).
2. Committee for Analytical Methods for Residues of Pesticides and Veterinary Products in Foodstuffs, *Analyst*, in preparation.
3. H. STAERK and A. SUESS, *Comparative Studies of Food and Environmental Contamination*, STI/PUB/348, p.417 (International Atomic Energy Agency, Vienna, 1974).
4. S. ASAKA and K. SEGUCHI, *Noyaku Kagaku* **2**, 107 (1974).
5. B. MALONE, *J. Assoc. Offic. Anal. Chem.* **52**, 800 (1969).
6. B. H. KENNETT and F. E. HUELIN, *J. Agric. Food Chem.* **5**, 201 (1957).
7. R. BIELORAI and E. ALUMOT, *J. Sci. Food Agric.* **16**, 594 (1965).
8. T. DUMAS and E. J. BOND, *J. Agric. Food Chem.* **23**, 95 (1975).
9. P. A. HARGREAVES, D. H. WAINWRIGHT and D. J. HAMILTON, *Pesticide Sci.* **5**, 225 (1974).
10. S. G. HEUSER and K. A. SCUDAMORE, *J. Sci. Food Agric.* **20**, 566 (1969).
11. Committee for Analytical Methods for Residues of Pesticides and Veterinary Products in Foodstuffs, *Analyst* **99**, 570 (1974).
12. B. BERCK, *J. Agric. Food Chem.* **22**, 977 (1974).
13. K. PFEILSTICKER, G. FABRICIUS and G. SCHULTE, *Z. Lebebsm. Unters.-Forsch.* **155**, 263 (1974).
14. K. A. SCUDAMORE and S. G. HEUSER, *Pesticide Sci.*, **2**, 80 (1971).
15. R. A. HOODLESS, F. J. JACKSON, K. R. TARRANT, and B. E. GRIFFITHS, *Pesticide Sci.* **5**, 555 (1974).
16. Committee for Analytical Methods for Residues of Pesticides and Veterinary Products in Foodstuffs, *Analyst*, **98**, 19 (1973).

Appendix IV: Residue Analysis of Insecticidal Carbamates 1974—5

Since the 1974 report a number of papers have appeared on the analysis of residual amounts of carbaryl, methomyl, mexacarbate, carbofuran, propoxur, promecarb, mesurol and zectran present in various media. Techniques employed include gas-liquid chromatography, thin-layer chromatography, liquid chromatography and colorimetry. Since direct analysis is often difficult, especially in the case of gas-liquid chromatography, many of the methods rely upon the formation of a derivative prior to the final determination. Multiresidue methods and carbaryl itself have received special attention. Studies on metabolism have been carried out on mexacarbate, carbofuran and tsumacide, thin-layer chromatography being generally used for their final determination.

Methods for the analysis of carbaryl residues often employ the use of alkaline hydrolysis to 1-naphthol. DESHMUKH and SINGH (1) have developed a single-step extraction and clean-up method for residues in fruits and vegetables. The dichloromethane extract of the sample is passed through an activated Florisil column and followed by hydrolysis with methanolic alkali. The resulting 1-naphthol is coupled with *p*-nitrobenzenediazonium fluoroborate and the optical density measured at 470 nm. Recoveries of fortified samples ranged from 81 to 92%. A similar method has been evolved by TAKAGI and TANIDA (2) for residual carbaryl on unpolished rice. In this case extraction is carried out with a mixture of dichloromethane, acetone and water. Clean-up is achieved by partitioning between *n*-hexane and acetonitrile and dual column chromatography on alumina and activated carbon. As in the previous method, the carbaryl is hydrolysed to 1-naphthol and coupled with *p*-nitrobenzenediazonium fluoroborate, but in this case the optical density is measured at 580 nm. Recoveries of fortified samples were reported to be 90%.

RANGASWAMY and MAJUMDER (3) used a direct colorimetric method for residues on grains. After methanol extraction the carbaryl is reacted with diazotized *o*-toluidine, and the product determined colorimetrically at 520 nm. The limit of detection was reported as 0.1 μ g carbaryl on a 20-g sample. Another direct method is that of PIECHOCKA (4) who used thin-layer chromatography in conjunction with enzyme inhibition in order to detect residual amounts of carbaryl in apples down to the 0.02 mg/kg level. Other thin-layer chromatographic methods required the conversion of the carbaryl to 1-naphthol. MUKHERJEE *et al.* (5) isolated the 1-naphthol on silica gel G before spraying with diazotized benzidine and the resulting pink

spots were eluted and measured in a colorimeter; the detection limit was 5 μ g.

MALININ (6) used thin-layer chromatography to determine carbaryl, 1-naphthol and metabolites in blood, urine and tissue. The hydrolysis may be performed on the plate with a spray of 15% KOH in 60% ethanol after development of the hexane or chloroform extract. Visualization with Blue B or Red GG enables 0.01 μ g to be detected. A rapid luminescence method has been developed for the determination of carbaryl residues in air, water and certain biological materials by KOSHCHYEYEV and LIVSHITS (7). This again relies on the formation of 1-naphthol, which is achieved by absorption on cotton saturated with aqueous sodium hydroxide. Cotton seeds are extracted with butyl alcohol and fruits and vegetables with benzene, and the resulting solutions excited with u.v. light in the presence of sodium hydroxide. Quantification is achieved by measuring the luminescence and comparison with known standards.

A gas-liquid chromatographic method for the determination of carbofuran and its toxic metabolites in animal tissue has been developed by WONG and FISHER (8). After extraction from the tissue by refluxing with hydrochloric acid for 1 hour at 100°C, the insecticide is partitioned into dichloromethane. Clean-up is achieved with column chromatography on activated Florisil and partitioning between acetonitrile, water (9+1) and petroleum spirit. The carbofuran and metabolites are then converted to their *N*-trifluoroacetyl derivatives and analysed by gas-liquid chromatography with electron capture detection. Recoveries of carbofuran, 3-hydroxycarbofuran and 3-ketocarbofuran were 84.2%, 83.8% and 72.8%, and the limits of detection 0.5 ppm, 0.05 ppm and 0.07 ppm respectively. YU *et al.* (9) studied the fate of carbofuran in a model ecosystem and analysed the compounds formed by thin-layer chromatography. For the end detection 15% methanolic KOH and 0.01% methanolic *p*-nitrobenzenediazonium fluoroborate were used.

BENEZET and MATSUMURA (10) carried out a similar study on the metabolism of mexacarbate by microorganisms. Silica gel was used for the thin-layer chromatographic determination with a mixture of ethyl ether, hexane and ethanol (70+20+3) as developing solvent.

A thin-layer chromatographic method involving a low-temperature clean-up has been used by McLEOD *et al.* (11) to determine residual quantities of methomyl in various foodstuffs. After extraction under reflux with a mixture of acetone, benzene and sulphuric acid, many impurities together with the water and benzene are removed by low-temperature precipitation (-78°C). The acetone containing the pesticide is washed with hexane and the methomyl

partitioned into chloroform. The concentrated extract is developed on a silica gel t.l.c. plate with a mixture of acetone and hexane and detected by enzyme inhibition. Recoveries from milk, eggs, beef, honey, butter, pork, peas and cabbage ranged from 70 to 90% for samples fortified at 0.5 mg/kg and from 40 to 90% for samples fortified at 0.05 mg/kg.

Multiresidue Methods

As in the case of specific residue determination, gas chromatographic multi-residue methods tend to rely upon the formation of a derivative prior to final analysis. Two methods have been published involving the electron capture detection of trifluoroacetyl derivatives. MASAKO and JUN (12) determined carbaryl and propoxur by g.l.c. with electron capture detection by heating the pesticides in the dark with trifluoroacetic anhydride. A limit of detection of 0.005 ppm was achieved and recoveries ranged from 91 to 99%. SEKITA *et al.* used a similar method for the determination of nine methylcarbamate insecticides in unpolished rice. The limit of detection for carbaryl was 0.15 ng and recoveries from fortified samples ranged from 86 to 106%. Another gas chromatographic method is that of AIZAWA *et al.* (14), which requires the use of an alkali flame ionization detector. The pesticides are hydrolysed with alkali or acid and the amines or phenols formed reacted with 1-fluoro-2, 4-dinitrobenzene, 4-chloro- α -trichloro-3-nitrotoluene or 4-chloro- α -trichloro-3, 5-dinitrotoluene. Products containing carbamate insecticides are extracted with acetone, buffered at pH 10, reacted with 1-fluoro-2, 4-dinitrobenzene and analysed by g.l.c. Recoveries from brown rice, grain and straw were 80% and from soil 90%, whilst the limit of detection was 0.005 ppm. A direct chromatographic method for the determination of some *N*-methylcarbamate pesticides has been published by LORAH and HEMPHILL (15). Carbaryl, mesurol, zectran and promecarb may be analysed using gas chromatography with non-polar liquid phases on silanized supports, for example Chromosorb W surface modified with Carbowax 20M. The use of an alkali flame detector gives recoveries of 90 to 100% in vegetables. The problem of on-column decomposition of the *N*-methylcarbamates may be overcome by using liquid chromatography. ISHII and OTAKE (16) used this approach for the separation of mixtures of *o*-chlorophenyl-, *o*-isopropylphenyl-, 3, 4-xylyl-, *m*-tetyl-, *o*-isopropylphenyl- and 3, 5-xylyl-*N*-methylcarbamate. The column was 2.2 mm internal diameter, 2.5 cm long and packed with Micropak CH or Micropak NH₂. Ultraviolet absorption was used for detection, either at 254 or 270 nm.

Residues of eight carbamate insecticides including carbaryl, propoxur and promocarb were determined colorimetrically by RAMASAMY (17). After a Soxhlet extraction with methanol, the insecticides were hydrolysed with hydrochloric acid, diazotized, reacted with sodium hydroxide and the optical density measured. The hydrolysis of these carbamates was investigated by McNEIL *et al.* (18).

Volume VII in the series *Analytical Methods for Pesticides and Plant Growth Regulators* entitled *Thin-layer and Liquid Chromatography and Analyses of Pesticides of International Importance* which was recently published contains recommended methods for residues of carbamate insecticides in various types of substrates.

In the previous report it was recommended that the method of HOLDEN (20) be collaboratively tested. The method, which involves gas-liquid chromatography of the 1-fluoro-2, 4-dinitrobenzene derivatives of methyl carbamates, has now been tested in the United States (21). Eight collaborators determined carbanolate, carbaryl, carbofuran and propoxur in apples, corn kernels, green beans and a leafy vegetable at levels of 0.1, 0.2 and 0.5 ppm. The recoveries were acceptable and the method was recommended for adoption as official first action by the AOAC (22).

References

1. S. N. DESHMUKH and J. SINGH, *J. Food Sci. Techn., India* **19**, 194 (1973).
2. Y. TAKAGI and K. TANIDA, *J. Food Hyg. Soc., Japan* **14**, 482 (1973).
3. J. R. RANGASWAMY and S. K. MAJUMDER, *J. Assoc. Offic. Anal. Chem.* **57**, 592 (1974).
4. J. PIECHOCKA, *Roczniki Panstowowego Zakladu Higieny* **24**, 409 (1973).
5. G. MUKHERJEE, A. K. MUKHERJEE and T. V. MATHEW, *Res. & Ind.* **17**, 147 (1972).
6. O. A. MALININ, *Veterinariya (Moscow)* **2**, 104 (1974).
7. A. K. KOSHCHEYEV and O. D. LIVSHITS, *Gig. Sanit.* **39**, 57 (1974).
8. L. WONG and F. M. FISHER, *J. Agric. Food Chem.* **23**, 315 (1975).
9. C. C. YU, G. M. BOOTH, D. J. HANSEN and J. R. LARSEN, *J. Agric. Food Chem.* **22**, 431 (1974).
10. H. J. BENEZET and F. MATSURMURA, *J. Agric. Food Chem.* **22**, 427 (1974).
11. H. A. McLEOD, C. E. MENDOZA and K. A. McCULLY, *Pesticide Sci.* **6**, 11 (1975).

12. M. LLCII and Y. KANAZAWA, *Japan Analyst* **22**, 16 (1973).
13. H. SEKITA, T. SUZUKI, M. TAKEDA and H. TANABE, *J. Food Hyg. Soc., Japan* **15**, 219 (1974).
14. T. AIZAWA, I. K. KAMUYAMA, S. SAWAFUJI and I. TAKASE, *J. Pesticide Sci.* **2**, 60 (1974).
15. E. J. LORAH and D. D. HEMPHILL, *J. Assoc. Offic. Anal. Chem.* **57**, 570 (1974).
16. Y. ISHII and T. OTAKE, *Bull. Agric. Chem. Inspect. Sta.* **13**, 32 (1973).
17. M. RAMASAMY, *Pesticide Sci.* **5**, 383 (1974).
18. J. D. MacNEIL, B. L. MacLELLAN and R. W. FREI, *J. Assoc. Offic. Anal. Chem.* **57**, 165 (1974).
19. *Analytical Methods for Pesticides and Plant Growth Regulators*, Vol. VII. (J. SHERMAN and G. ZWEIG, Eds.): *Thin-layer and Liquid Chromatography and Analyses of Pesticides of International Importance* (Academic Press, New York: 1973).
20. E. R. HOLDEN, *J. Assoc. Offic. Anal. Chem.* **56**, 713 (1973).
21. R. W. STORHERR, *J. Assoc. Offic. Anal. Chem.* **58**, 233 (1975).
22. *J. Assoc. Offic. Anal. Chem.* **58**, 397 (1975).

Appendix V: A Comment on the Residue Analytical Methods for Carbamate Insecticides

We have been carrying out for these several years residue analysis of *o*-secondarybutyl phenyl- (BPMC, Bassa), *m*-cresyl- (MTMC, Tsumacide) or 3, 4-xylyl- (MPMC, Meobal) *N*-methylcarbamate in rice grains, rice straw and in green tea by utilizing two methods, dinitrophenylation of methylamine and trifluoroacetylation of *N*-methylcarbamate (*N*-methylcarbamates are being used mainly to these two crops in Japan).

1. 2, 4-Dinitrophenylation

The original method of HOLDEN *et al.* (1) essentially consists of two steps. First, carbamates are hydrolyzed in a strong alkali to liberate methylamine. Phenols and unwanted materials are removed by extraction with dichloromethane under acidification of the reaction mixture. Second, the reaction mixture was brought back to a slightly alkaline pH where dinitrophenylation of the amine is carried out with 1-fluoro-2, 4-dinitrobenzene. We modified this method as follows to include alkaline hydrolysis and dinitrophenylation in one step (2, 3): *N*-methylcarbamate and 1-fluoro-2, 4-dinitrobenzene is heated in dioxane at pH 10 (borax buffer) for 30 min, to which is then added

saturated glycine solution (pH adjusted to 10) and heating is contained for further 10 min, to remove unreacted 1-fluoro-2, 4-dinitrobenzene. After cooling 2, 4-dinitrophenyl methylamine is extracted with benzene. The minimum detectability of the amine derivative is 0.2 ng by electron capture detector. The recovery of fortified *N*-methyl carbamates at 0.2 to 0.5 ppm ranges from 82% to 92% from rice grains, dried rice straw or green tea.

Although the modified method is simpler and more rapid than the original one, it is still not exempt from several drawbacks. For example, in actual samples the blank values are sometimes high (0.005–0.01 ppm), necessitating further clean-up before gas chromatography. Secondly, the method lacks selectivity in nature. Therefore in multiresidue analysis *N*-methylcarbamates should be separated from one another by suitable methods such as column chromatography and t.l.c.

2. Trifluoroacetylation

Trifluoroacetylation is done under different conditions; 24 h at 100°C (4), overnight at room temperature (5) and 3 h at 50°C (6). Reaction of 0.1~100 µg of BPMC, MTMC and MPMC with 0.1 ml of trifluoroacetic anhydride in ethylacetate afforded complete trifluoroacetylation (98.8 ~100.7%) in our case at 70°C for 90 min. The products are stable up to 4 h at 70°C. Ethylacetate is better than benzene or ethylether (35°C) as the solvent. The minimum detection limit for the trifluoroacetylated-BPMC, -MTMC and -MPMC are 0.005, 0.005 and 0.04 ng, respectively, easy to analyze 0.01 ppm or less of the residue. Actual samples give the blank value of 0.003 ppm (acetone or acetonitrile extraction, transfer to dichloromethane and the *n*-hexane/acetonitrile partition). For further clean-up florisil column chromatography or t.l.c. should be carried out before trifluoroacetylation, as the fluoroacetylated products do not recover well from florisil or silica gel. Recovery of the carbamates at 0.2 ppm from rice grains is 87% or better.

In addition to the intrinsic selectivity, this method enables the determination of a lesser amount of the residue than the previous method.

Unlike the reported alkaline flame ionization detector ($\text{Rb}_2\text{SO}_4/\text{KCl}$, 9/1) (8), our AFID (KBr single crystal) (9) responds much better to phosphorus (10,000 times relative to FID) than to nitrogen (100 times). So, our AFID is not suitable for detection of nitrogen containing compound (10).

References

1. E. R. HOLDEN, W. M. JONES and M. BEROZA, *J. Agric. Food Chem.* **17**, 56 (1969).
2. S. SUMIDA, M. TAKAKI and J. MIYAMOTO, *Agric. Biol. Chem.* **34**, 1576 (1970).
3. S. SUMIDA, M. TAKAKI and J. MIYAMOTO, *Botyu-Kagaku* **35**, 72 (1970).
4. J. N. SEIBER, *J. Agric. Food Chem.* **20**, 443 (1972).
5. H. SEKITA, T. SUZUKI, M. TAKEDA and H. TANABE, *J. Food Hyg. Soc., Japan* **15**, 219 (1974).
6. M. UEGI and J. KANAZAWA, *Japan Analyst* **22**, 16 (1973).
7. Y. TAKIMOTO, M. HIROTA and J. MIYAMOTO, unpublished (1975).
8. T. AIZAWA, I. KAMIYAMA, T. SAWAFUJI and I. TAKASE, *J. Pesticide Sci.* **2**(2), 60 (1974).
9. Y. SATO, J. MIYAMOTO and S. SUZUKI, *Botyu-Kagaku* **33**, 8 (1968).
10. Y. TAKIMOTO, J. OHNISHI and J. MIYAMOTO, unpublished (1975).

Appendix VI: Dithiocarbamate Fungicides and Ethylenethiourea

In our last reviews on the residue methodology for ethylenethiourea (ETU), we have described in reports to the Commission in 1973 and 1974 various analytical techniques for ETU comprising g.l.c., t.l.c., combined g.l.c.—t.l.c. and polarography. All these techniques have utilized the principle of forming an appropriate derivative to assist in the assay of ETU and the EBDC fungicides transformation and degradation products. By applying this principle, NASH(2) has improved NEWSOME's method (3) (based on electron-capture g.l.c. of trifluoroacetyl derivative of *S*-benzylated ETU) which unfortunately does not give consistent and complete recoveries, by substituting pentafluorobenzoyl chloride for trifluoroacetic anhydride for derivatization of *S*-benzylated ETU. RESNICK found that the pentafluorobenzoylation product gave recoveries of near 100% and improved the electron-capture g.l.c. response, and that the clean-up of this product by column chromatography will eliminate interfering g.l.c. peaks, so troublesome in the NEWSOME method (4). Later NASH described an additional method (5) in which *o*-chlorobenzyl chloride is substituted for benzylchloride followed by pentafluorobenzoylation. By combining the two techniques, two ETU derivatives, 2-(*o*-chlorobenzylthio)-1-(pentafluorobenzoyl)-2-imidazoline and 2-(benzylthio)-1-(pentafluorobenzoyl)-2-imidazoline, can be prepared from the same

extract, thus allowing confirmation of the presence and quantity of ETU at the > 5 ppb level. We have made a comparative study in our laboratory (7), comparing the NEWSOME's method with the newly modified NASH technique, and can confirm NASH's conclusions on the reliability of the method for the determination of ETU residues.

Mention should be made of a Russian work (6) on combined t.l.c. and spectrophotometric determination of some parent dithiocarbamate fungicides and their conversion products which came to our attention only recently. In this work the authors claim that the best solvents for the t.l.c. (on alumina—starch—gypsum 19:1:5) of Ziram and its conversion products (e.g. thiram and tetramethylthiourea), is hexane—benzene—acetone (20:2:5); that for zineb and its conversion products (ethylenethiuram monosulphide, imidazoline-2-thione and S) is benzene—dimethylformamide (9:1). The compounds can be detected by spraying the chromatogram with 0.66% solution of NaN_3 5 mN iodine in 40% MeOH. For determination, the compounds are best extracted from the adsorbent with 0.2 N NaOH for subsequent u.v. spectrophotometry at the absorption maxima. According to the authors, detection limits are better than $1 \mu\text{g}$.

References

1. S. L. GRAHAM, N. H. HANSEN, K. J. DAVIS and C. H. PERRY, *J. Agric. Food Chem.* **21**, 324–329 (1973).
2. R. G. NASH, *J. Assoc. Offic. Anal. Chem.* **57**, 1015–1021 (1974).
3. W. H. NEWSOME, *J. Agric. Food Chem.* **29**, 967–969 (1972).
4. W. H. NEWSOME, 164th Meeting of the American Chem. Soc., New York, Abstr. Pest. 43 (1972).
5. R. G. NASH, *J. Assoc. Offic. Anal. Chem.* **58**, 566–571 (1975).
6. M. A. KLISENKO and M. Sh. VEKHSTEIN, *Zt. Analit.* **28** (1), 159–162 (1973).
7. Ch. RESNICK and J. ADATO, unpublished work.

Appendix VII: Carbamate Herbicides

Very little has been published since our last review regarding methodology for residues of members of the group of carbamate herbicides, which includes eleven such herbicidal compounds: diallate, cycloate, dichlormate, swep, chlorpropham, EPTC, perbulate, vernolate, barban, butylate and molinate. In 1971 a general method (1) was described, which since then has successfully been applied to the analysis of residues of these compounds. This

general method — a g.l.c. method — utilizes three separate detectors for the three types of the carbamate herbicides structure:

- (i) Thermionic detector for nitrogen-containing compounds.
- (ii) Flame photometric detector for sulphur-containing compounds.
- (iii) Electron capture detector for halogen-containing compounds.

Mention has already been made in our last review on the desirability of using in this method the electrolytic conductivity detector instead of the thermionic detector for the determination of residues of nitrogen-containing carbamates, for reasons of increased sensitivity and ease of interpretation of the peaks obtained. In the light of work now going on regarding the applicability of this method to all members of this herbicidal group, the desirability of this interchange of detectors becomes more apparent (2).

References

1. J. H. ONLEY and G. YIP, *J. Assoc. Offic. Anal. Chem.* **54**, 1366 (1971).
2. G. YIP, *J. Chromatog.* **13**, 225 (1975).

Appendix VIII: Analysis of Tin Compounds

Some organotin compounds are nowadays used as pesticides. The most important of these are tricyclohexyltin hydroxide, triphenyltin hydroxide, and triphenyltin acetate and chloride. The determination of residues of these compounds has proved problematic, especially with regard to the specificity of most of the existing analytical methods. This is due to similarity of the chemical structure and behaviour, for example solubility, of these compounds.

The total tin of a sample can be determined by the dithiol colorimetric method (1), pyrocatechol violet colorimetric method (2), or fluorometric method (3).

For the determination of organotin, methods have been developed that are suitable principally for the determination of residues of either tricyclohexyltin hydroxide (4–6) or of triphenyltin compounds (7–10). WOGGON and JEHLE (11) have developed a system in which triphenyltin compounds can be separated from tri-, di- and monobutyltin compounds by using t.l.c. and determined in inorganic form by means of anodic stripping voltammetry. Specific differentiation of tricyclohexyltin hydroxide from triphenyltin compounds in this method has not yet been demonstrated. BOOTH and FLEET (12) have developed the anodic stripping voltammetric method for the determination of residues of triphenyltin compounds. To this analytical

system BOOTH *et al.* (13) have adapted automatization. This method allows determination without breakdown of triphenyltin ion, but it is not definitely known whether the method is specified for triphenyltin ions in the presence of tricyclohexyltin ions.

On the other hand, methods suitable only for the determination of total tin in a sample are not recommendable even in cases when the source of organotin is known, because the natural tin content of foods varies unexpectedly and so may cause serious errors. In addition, foods are subject to contamination with tin if canned in tin-plated cans.

The presence of tricyclohexyltin hydroxide can be specifically tested by the gas-liquid chromatographic methods presented by KUTSCHINSKI (14), KUTSCHINSKI (15) or by the corresponding method developed by GAUER *et al.* (16), depending on the material to be analysed. The presence or absence of residues of triphenyltin compounds can be specifically tested by the method presented by BURGER (17).

References

1. H. B. CORBIN, Separation and determination of trace amounts of tin present as organotin residues on fruits, *J. Assoc. Offic. Anal. Chem.* **53**, 140 (1970).
2. H. B. CORBIN, Rapid and selective pyrocatechol violet method for tin. *Anal. Chem.* **45**, 534 (1973).
3. T. D. FILER, Fluorometric determination of submicrogram quantities of tin. *Anal. Chem.* **43**, 1753 (1971).
4. Cyclohexyltin residues on apples, Metal & Termit Corp., Rahway, New Jersey (18 July 1967).
5. Determination of small amounts of organotin in macerated fruit. Method Ta-2-2, M&T Chemicals Inc. Rahway, New Jersey (11 August 1969).
6. H. B. CORBIN, The determination of organotin residues in bovine muscle, liver, kidney, fat and milk, ACR 71.13 July 8 (1971). M&T Chemicals Inc. Rahway, New Jersey.
7. R. BOCK, S. GORBACH and H. OESER, Analyse von Triphenylzinn-Verbindungen. *Angew. Chem.* **70**, 272 (1958).
8. S. GORBACH and R. BOCK, Die Bestimmung kleiner Mengen von Triphenylzinnacetat in Pflanzenmaterial. *Frezenius' Z. Anal. Chem.* **163**, 429 (1958).
9. E. KRÖLLER, Triphenylverbindungen im Pflanzenschutz und ihre Rückstandbestimmung. *Deutsche Lebensmittel.* **56**, 190 (1960).

10. B. THOMAS and H. L. TANN, Pesticide residues in foodstuffs in Great Britain. XV. Triphenyltin residues in potatoes. *Pesticide Sci.* **2**, 45 (1971).
11. H. WOGGON and D. JEHLE, Zur Rückstandsanalyse Biozider Organozinn-Verbindungen mit Hilfe der Inversvoltammetrie. *Die Nahrung* **19**, 271 (1975).
12. M. D. BOOTH and B. FLEET, Electrochemical behaviour of triphenyltin compounds and their determination at submicrogram levels by anodic stripping voltammetry. *Anal. Chem.* **42**, 825 (1970).
13. M. D. BOOTH, M. J. D. BRAND and B. FLEET, A fully automatic apparatus for stripping voltammetry. *Talanta* **17**, 1059 (1970).
14. A. H. KUTSCHINSKI, Identification of residues of tricyclohexyltin hydroxide in beef muscle, kidney and liver by gas chromatography, ACR 72.11 (18 February 1972). Dow Chemical Co.
15. A. H. KUTSCHINSKI, Gas chromatographic method for the determination of tricyclohexyltin hydroxide in orange juice, ACR 72.11 (10 August 1972). Dow Chemical Co.
16. W. O. GAUER, J. N. SEIBER and D. G. CROSBY, Determination of organotin residues from plictran in fruit crops by gas-liquid chromatography. *J. Agric. Food Chem.* **22**, 252 (1974).
17. K. BÜRGER, Zur Analytik von Organozinnverbindungen, *Z. Lebensm.-Unters. u.-Forsch.* **114**, 1 (1961).

SECTION ON WATER QUALITY (VI.6)

4 and 6 September 1975

Present: Dr. S. FREYSCHUSS (Chairman), Mr. B. GÖRANSSON (Secretary), Dr. P. GRAU, Dr. K. TROBISCH (Titular Members); Mr. V. BROUWERS (Observer).

1. Minutes of Previous Meeting

The minutes of a meeting held in Brussels on 30 June 1974 had been published in *Inf. Bull.*, Nos. 50/51 (November 1975), p.14.

2. Present Section Projects

A survey was made over the present situation and future plans concerning the projects of the Section. The following conclusions and recommendations were made:

Project 1: Pollution Abatement in Industry. Hitherto the main efforts of the Section had been concentrated on this project. Two International congresses had been arranged on this subject in 1970 and in 1975 – both with considerable success. In the last congress part of the programme was devoted to questions concerning solid and liquid waste. It was recommended that the Section should carry on with this project and concentrate its efforts on 'low or no waste technology', with the aim to arrange a new congress around 1980.

Dr. TROBISCH reported that the chemical industry spend about 15% of their investment and 25% of their research on pollution abatement. In total the chemical industry spend 3–4% of their sales value for pollution abatement purposes. That is often more than the profit. Dr. FREYSCHUSS added that approximately the same figures were true for the pulp and paper industries. Dr. GRAU drew attention to the tendency in industry to develop 'long-life products'.

Project 2: Microbiological Aspects of Effluent Treatment. In cooperation with the Section on Fermentation, the Section on Water Quality had tried to arrange a symposium on this subject in Paris in 1974. However, the efforts failed due to financial reasons.

Dr. GRAU offered to make arrangements for a symposium on 'Microbiological Processes in Industrial Waste Treatment' in Prague. The matter was discussed in a joint meeting with the Section on Fermentation

on 5 September. (see page 427).

Projects 3 and 4: Nomenclature in Water Chemistry and Education in Water Chemistry. In the absence of the project leader — the proposed new chairman of the Section Dr. WAGNER — the projects were only briefly discussed.

Project 5: ISO TC/147 on Water Quality. It was decided that the Section should carry on according to the lines drawn up earlier. Dr. P. O. BETHGE should be asked to carry on as the person responsible for the project.

Project 6: COWAR. As Prof. E. A. PEARSON, who was responsible for the project, had not been able to either attend this meeting nor give a written report (due to serious illness) it was decided to postpone discussion of this project to another occasion.

3. Future Section Projects

The Section discussed possible future projects for the Section. Problems connected with the following subjects were discussed but no decision was made with the motivation that the new chairman should have the opportunity to influence work on new projects.

- (i) Treatment of waste water with respect to heavy metals
- (ii) Treatment of storm sewer waste water
- (iii) Elimination of nutrient from waste water
- (iv) Virus in sludge from biological treatment
- (v) Long-term aspects of deposition of solid industrial waste

4. Miscellaneous Matters

It was decided that the cooperation with IAWPR should be further developed. Co-sponsorship of meetings should be considered whenever appropriate.

A discussion concerning the future composition and organization of the work of the Section was postponed to a later occasion when the new chairman could attend.

**Joint Meeting of Sections on Water Quality
and Fermentation Industries**

5 September 1975

The Chairman, Prof. PIRT, on behalf of the Fermentation Industries Section reviewed the development in the area of common interest between Munich and Madrid IUPAC conferences. He pointed out that organizing a symposium on microbiological aspects of water pollution control remained the primary objective. He also reminded that such a symposium should stress upon scientific theories covering the field rather than upon everyday practices. The main topics were: identification of species, their metabolism and physiology, population dynamics of mixed cultures, the kinetics of growth and substrate metabolism, energetics and thermodynamics, use for biomass as source of proteins, etc.

Prof. GRAU offered to organize such a meeting in Prague, Czechoslovakia, and gave details on the expected programme as proposed by the Water Quality Section. It was agreed that programme committee should consist of six members as follows:

Prof. P. GRAU – Chairman (Prague Inst. of Chemical Technology)

Prof. A. E. HUMPHREY (University of Pennsylvania, Philadelphia)

Prof. E. A. PEARSON (University of California, Berkeley)

Prof. S. J. PIRT (Queen Elizabeth College, University of London)

Prof. TAKAHASHI (Tokyo University of Education, Tokyo)

Dr. K. H. TROBISCH (Hoechst AG, Environment Division)

After accepting the objectives of the conference and its size, organization, place and time the joint meeting was closed. Subsequently, the programme committee of the proposed symposium had its first meeting.

OPEN MEETING OF APPLIED CHEMISTRY DIVISION

5 September 1975

Present: Dr. H. EGAN (President), Dr. R. W. CAIRNS (Past President), Prof. H. SUOMALAINEN (President-Elect), Dr. A. J. COLLINGS (Secretary) and about 60 other members of the Division, together with Prof. G. OURISSON (Organic Chemistry Division).

1. Minutes of Previous Meeting

The minutes of the Open Meeting of the Division held in Munich on 26 August 1973 had been published (*Comptes Rendus XXVII Conference, Part B*, pp. 337–339) and were accepted.

2. IUPAC Statutes and By-laws

Dr. EGAN referred to the proposed revisions of the Statutes and By-laws, due to come before Council at its meeting on 9 September, the main effect of which for the Applied Chemistry Division would be the change of status of Sections to Commissions. This would be on the basis of eight Commissions, on Air Quality, Water Quality, Fermentation, Food Additives, Food Contaminants, Pesticide Residues Analysis, Terminal Pesticides Residues and Oils & Fats, as already discussed; together, subject to the approval of IUPAC Bureau on 8 September, with a Commission on the Reclamation of Solid Wastes. With Prof. SUOMALAINEN, he outlined the main difficulties which the change would present. Dr. MARCUSE expressed particular concern at the need for coordination of the work between certain Commissions. Dr. EGAN suggested three ways in which this might be done, (1) by arrangement between Chairmen, for example to hold joint meetings; (2) by the special appointment of a Joint Commissions' Coordinating Chairman, designated in the membership lists, for the two Commissions concerned; or (3) through 'Corresponding Members' of the Applied Chemistry Division Committee, appointed by that Committee to interpret the work of individual Commissions to the Committee and to represent the Commission's viewpoint to the Committee but not to take a main part in the management of the Commission. Professor SUOMALAINEN circulated a note concerning the special problems and said that the change must be made carefully over a suitable period of time: it should be possible to make the change in the period 1975–7 and it was agreed that these views should be conveyed to the Bureau.

3. Projects and Programme

Dr. EGAN thanked Section and Commission Chairmen for preparing the project statements but regretted that none had been received from the Air Quality Section. The statements would be considered by the Division Committee, which would try to ensure that there was a correct balance of work within the Division; and would evaluate the need for further diversification of the overall programme. It was emphasized that once a project was agreed, it was for the Commission concerned to progress the work and to report to the Division from time to time.

4. Reports of Sections

At the request of Dr. EGAN, the Chairmen of Sections, Dr. MARCUSE, Drs. VOS, Prof. HUMPHREY (for Dr. KINOSHITA), Dr. FREYSCHUSS, Mr. MONKMAN and Dr. FREHSE (for Dr. ABBOTT) reported briefly on the work of their Section and Commissions. Dr. EGAN emphasized the need to be aware of the needs of the international agencies and expressed the thanks of the Division to the Chairmen and members of all Sections and Commissions, particularly those who would be retiring at the conclusion of the Conference.

5. Health and Environmental Interests

Dr. EGAN reported that whilst the Division Committee agreed that programmes on health and environmental problems should be developed within all Divisions of IUPAC where appropriate, those for which the interest spanned all Divisions might best be developed by the Applied Chemistry Division. It was also important that there was the means to identify the total health and environmental interest of IUPAC and where appropriate to coordinate these; but it was not considered the time to form a new Division of Health and Environmental Chemistry.

6. Committee Membership

Dr. EGAN announced the officers of the Division as: President, Dr. H. EGAN; President-Elect, Prof. H. SUOMALAINEN; Vice-President, Dr. W. G. STOLL; Secretary, Dr. A. J. COLLINGS. Members who continued on the Committee were Dr. J. A. EPSTEIN and Dr. A. F. LANGLYKKE. Dr. COLLINGS reported that there were four vacancies on the Applied Chemistry Division Committee, for which five nominations had been received. Following a ballot then conducted, at which each member was requested to cast votes for *four*

committee members, Dr. H. FREHSE, Dr. S. FREYSCHUSS, Dr. R. MARCUSE and Prof. D. REYMOND were declared elected.

7. Analytical Chemistry

Dr. EGAN reported that at a joint meeting of the Committees of the Analytical and Applied Chemistry Divisions held on 2 September, it had been agreed in principle that the ISO recommendations for setting out methods of analysis should be adopted. He also reported that Dr. A. J. COLLINGS (Applied Chemistry Division) and Dr. H. FRIESER (Analytical Chemistry Division) had been appointed to liaise between the Divisions on analytical matters.

LIST OF ABBREVIATIONS

ACS	American Chemical Society
AFCAT	Association Française de Calorimétrie et d'Analyse Thermique
AIRAPT	International Association for Advancement of High Pressure Science and Technology
AOAC	Association of Official Analytical Chemists
AOCS	American Oil Chemists' Society
ASIDIC	Association of Scientific Information Dissemination Centres in USA
ASTM	American Society for Testing and Materials
BAM	Bundesanstalt für Materialprüfung in Federal Republic of Germany
BIPM	Bureau International des Poids et Mesures
BSO	Broad System of Ordering
CAS	Chemical Abstracts Service
CBN	IUPAC-IUB Commission on Biochemical Nomenclature
CEE	Communauté Européenne Economique
CEI	Commission Electrotechnique Internationale
CID	Comité International des Dérivés Tensio-Actifs
CIPAC	Collaborative International Pesticides Analytical Council
CIPM	Comité International des Poids et Mesures
CNA	Chemical Notation Association
CNOC	IUPAC Commission on Nomenclature of Organic Chemistry
CNRS	Centre National de la Recherche Scientifique in France
CODATA	ICSU Committee on Data for Science and Technology
COMECON	Council of Mutual Economic Assistance of Communist Nations
COSPAR	ICSU Committee on Space Research
COWAR	ICSU Committee on Water Research
CQUCC	IUPAC Commission on Quantities and Units in Clinical Chemistry
ECE	UN Economic Commission for Europe
EFEMA	European Food Emulsifier Manufacturers' Association
EFMC	European Federation for Medicinal Chemistry
EPA	US Environmental Protection Agency
EPPO	European Plant Protection Organization
EUSIDIC	European Association of Scientific Information Dissemination Centres

FAO	UN Food and Agriculture Organization
FATIPEC	Fédération d'Associations de Techniciens des Industries des Peinture
FECS	Federation of European Chemical Societies
FID	Federation Internationale de Documentation
FSPT	US Federation of Societies of Paint Technology
GIFAP	Groupeement International des Associations Nationales de Fabricants de Pesticides
IAEA	International Atomic Energy Agency
IAPS	International Association for the Properties of Steam
IAPT	International Association of Plant Taxonomy
IARC	WHO International Agency for Research on Cancer
IARIGA	International Association of Research Institutes for the Graphic Arts Industry
IAWPR	International Association on Water Pollution Research
ICAG	IUPAC International Company Associates Group
ICC	International Association for Cereal Chemistry
ICSU	International Council of Scientific Unions
ICSU AB	ICSU Abstracting Board
ICTA	International Confederation for Thermal Analysis
IDCNS	IUPAC Interdivisional Committee on Nomenclature and Symbols
IDF	International Dairy Federation
IFCC	International Federation of Clinical Chemistry
IMA	International Mineralogical Association
ISE	International Society of Electrochemistry
ISO	International Organization for Standardization
ISO/TC	ISO Technical Committee
ISO/TC SC	ISO/TC Sub Committee
IUB	International Union of Biochemistry
IUCr	International Union of Crystallography
IUFoST	International Union of Food Science and Technology
IUGS	International Union of Geological Sciences
IUPAB	International Union of Pure and Applied Biophysics
IUPAP	International Union of Pure and Applied Physics
IUPHAR	International Union of Pharmacology
MAFF	UK Ministry of Agriculture, Fisheries, and Food
NAS-NRC	National Academy of Sciences-National Research Council in USA

NATO	North Atlantic Treaty Organization
NBS	US National Bureau of Standards
NIH	US National Institutes of Health
NPL	UK National Physical Laboratory
OCCA	Oil and Colour Chemists' Association in UK
OECD	Organization for Economic Cooperation and Development
OICC	Office International du Cacao et du Chocolat
OSTI	UK Office of Scientific and Technical Information
PAG	Protein Advisory Group of FAO/WHO/UNICEF
PTB	Physikalisch-Technische Bundesanstalt in Federal Republic of Germany
SAC	Society for Analytical Chemistry in UK
SCI	Society of Chemical Industry in UK
SCOPE	ICSU Scientific Committee on Problems of the Environment
SI	Système International
SLF	Federation of Scandinavian Paint and Varnish Technicians
SUN	IUPAC Commission for Symbols, Units, and Nomenclature
TRC	Thermodynamics Research Center at Texas A & M University
UKCIS	United Kingdom Chemical Information Service
UN	United Nations
UNESCO	UN Educational, Scientific, and Cultural Organization
UNICEF	UN Children's Fund
UNIDO	UN Industrial Development Organization
UNISIST	UNESCO-ICSU Programme on International Science Information System
USGS	United States Geological Survey
WHO	UN World Health Organization
WMO	World Meteorological Organization

New IUPAC Publications from Pergamon

POLYMERIZATION OF HETEROCYCLES (Ring-Opening)

S. PENCZEK, *Polish Academy of Sciences, Centre of Molecular & Macromolecular Studies, Lodz, Poland*

Main lectures presented at the International Symposium on Polymerization of Heterocycles (Ring-Opening), Warsaw-Jablonna, Poland, 23-25 June 1975. The Symposium was jointly organized by the Centre of Molecular and Macromolecular Studies of the Polish Academy of Sciences in Lodz and by the Centre de Recherches sur les Macromolécules (C.R.M.) - C.N.R.S. - in Strasbourg.

Contents (partial): Ions and ion pairs. Their meaning and significance in organic reactions, M. SZWARC. Anionic polymerization of methylphenylspirobicyclosiloxanes, K.A. ANDRIANOV and A.B. ZACHERNYUK. Stereoselection and stereoselection in the ring-opening polymerization of epoxides and episulfides, P. SIGWALT. Mechanistic features of polymerization of N-carboxy- α -Aminoacid anhydrides - comparison with those of 1,2-Epoxides, T. TSURUTA. New developments in cationic and anionic aldehyde polymerization, P. KUBISA et al. Some aspects of the polymerization of 1,3-Dioxacycloalkanes, P.H. PLESCH. A new class of polyethers - Poly (1,4-Dichloro-2,3-Epoxybutane)s-Synthesis, mechanism and property aspects, E.J. VANDENBERG. No catalyst copolymerization by spontaneous initiation mechanism, T. SAEGUSA. New aspects of the nucleophilic opening of epoxide rings, N.S. ENIKOLOPIYAN. Polymerizability of lactams, J. SEBENDA. Cyclic oligomers in the cationic polymerization of heterocycles, E.J. GOETHALS.

Of interest to: Academic and industrial research workers in polymer chemistry.

ISBN 0 08 021367 7

\$18.00 £10.00

126pp Approx

272 x 188mm

Spring 1977

Previously published in **PURE & APPLIED CHEMISTRY**, Vol 48 No 3, and supplied to subscribers as part of their subscription.

New IUPAC Publications from Pergamon

**Recommended Reference Materials for Realization of
Physicochemical Properties. Section: Density (0 08 021017 1)**

**Nomenclature of Organic Chemistry. Section E:
Stereochemistry (0 08 021019 8)**

**Effect of Molecular Orientation on Mechanical Properties of
Polystyrene (0 08 021018 X)**

**Classification and Nomenclature of Electroanalytical
Techniques (0 08 021226 3)**

**Nomenclature, Symbols, Units and their Usage in
Spectrochemical Analysis**

II—Data Interpretation

**III—Analytical Flame Spectroscopy and Associated Non-flame
Procedures (0 08 021227 1)**

**Manual of Symbols and Terminology for Physicochemical
Quantities and Units. Appendix II—Definitions, Terminology
and Symbols in Colloid and Surface Chemistry. Part II:
Heterogeneous Catalysis (0 08 021360 X)**

Atomic Weights of the Elements 1975 (0 08 021406 1)

**A Collaborative Study on Tensile Properties of Rigid PVC.
Long-Time Transition (0 08 021574 2)**

**Recommended Reference Materials for Realization of
Physicochemical Properties. Section: Molecular Weight
(0 08 021575 0)**

**Recommendations for Nomenclature of Ion-Selective
Electrodes (0 08 021576 9)**

Nomenclature of Corrinoids (0 08 021577 7)

**Physicochemical Measurements: Catalogue of Reference
Materials from National Laboratories (0 08 021578 5)**

**Nomenclature of Regular Single-Strand Organic Polymers
(0 08 021579 3)**

Price \$6.00 £3.30 each
Please quote ISBN on order



Pergamon Press

Headington Hill Hall, Oxford, OX3 0BW
Fairview Park, New York 10523 USA

